THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIX. No. 1769.] LONDON, APRIL 6, 1897. [49TH YEAR. PRICE 6d.

TUBES AND FITTINGS
FOR
GAS, STEAM, WATER,
AND ALL PURPOSES,
ALSO
COILS OF EVERY SIZE AND SHAPE.

Apply to the Original Firm of
JOHN BROTHERTON
LIMITED,
Imperial Tube Works, Monmore Green,
WOLVERHAMPTON.
ESTABLISHED 1861.

GAS CONSUMERS' REQUIREMENTS.
TUBES, COCKS, UNIONS, BRACKETS, PENDANTS, LANTERNS, CHANDELIERS, AND GENERAL FITTINGS.
MANUFACTURED BY
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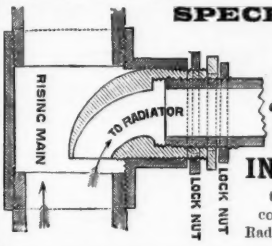

SPECIALITE
FOR
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'ACME'
PATENT
INJECTOR,
to be fixed in connection with Radiators on Mains.

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Manufacturers & Contractors.
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Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores, for Gas and Water Works.
WORKS:
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'BEAR CREEK' CANNEL
LOG MOUNTAIN COAL, COKE, AND TIMBER CO.
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Cable Address:
"HULL, PINEVILLE." Codes used "ABC" & "A1."
Communications to the Company only.

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"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

4,444
"MELDRUM" FURNACES
MADE TO DECEMBER 16th, 1896.
No Gas-Works should be without. WRITE FOR CATALOGUE & TESTIMONIALS.
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Also at London, Leeds, Birmingham, Liverpool, Newcastle, and Glasgow.

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(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

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(ESTABLISHED 1765).

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WROUGHT AND CAST IRON TANKS FOR DITTO,

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Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

EDWARD COCKEY & SONS, LIMITED,

ENGINEERS & CONTRACTORS FOR GAS-WORKS,

MAKERS OF FISH AND SMITH'S PATENT (NO. 5108) OVERFLOWS FOR REGULATING THE SEAL IN GAS-WASHERS, &c.

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Improved Dry-Faced Centre Valves for Working either One, Two, Three, or Four Purifiers at one time; giving an increase of Purifying Area above that obtainable with ordinary Centre Valves of 33⅓ per Cent.

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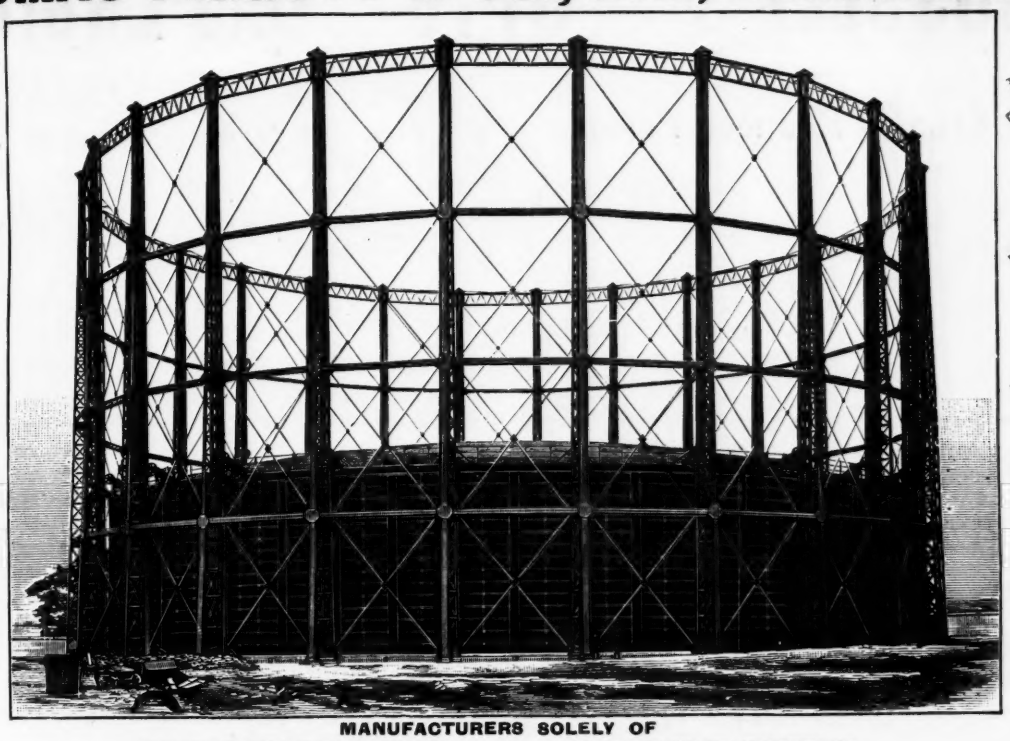

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INSTALLATIONS have already been supplied, and are in operation at the following Gas-Works: COPENHAGEN, BELFAST, GLASGOW, BRUSSELS, SANTIAGO, SWANSEA, TOTTENHAM, LIVERPOOL, BRIGHTON, BATH, PRESTON, SOUTHPORT, NEW YORK, NEWBURGH (N.Y.), NEWBURGH (Second Contract), HOYLAKE; and are in course of erection at: BELFAST (Second Contract), EDINBURGH, TOTTENHAM, WINCHESTER, MANCHESTER, BRUSSELS (Second Contract), ST. JOSEPH (MO.), HOLYOKE (MASS.), SHANGHAI, STOCKTON, STOCKPORT, NORWICH, GUILDFORD, SYRACUSE, BORDENTOWN, LEA BRIDGE, COVENTRY.

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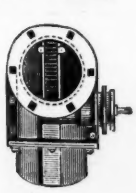
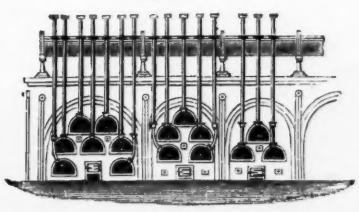
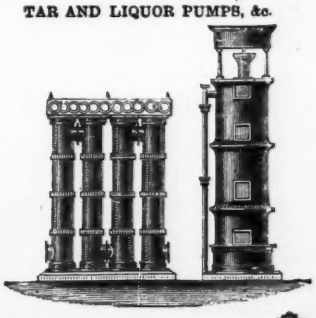


CAST-IRON RETORTS, RETORT-BED FITTINGS, *And Retort-House Appliances* of every description, Iron Roofs, Columns, Girders, Floor Plates, Tools, &c.



WROUGHT AND CAST IRON **CONDENSERS, SCRUBBERS, & WASHERS,** TAR AND LIQUOR PUMPS, &c.



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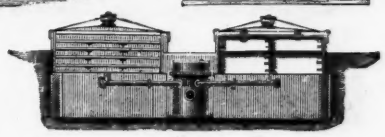
PURIFIERS with Planed Joints, HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS. WOOD GRIDS. CAST AND WROUGHT IRON TANKS AND CISTERNS.



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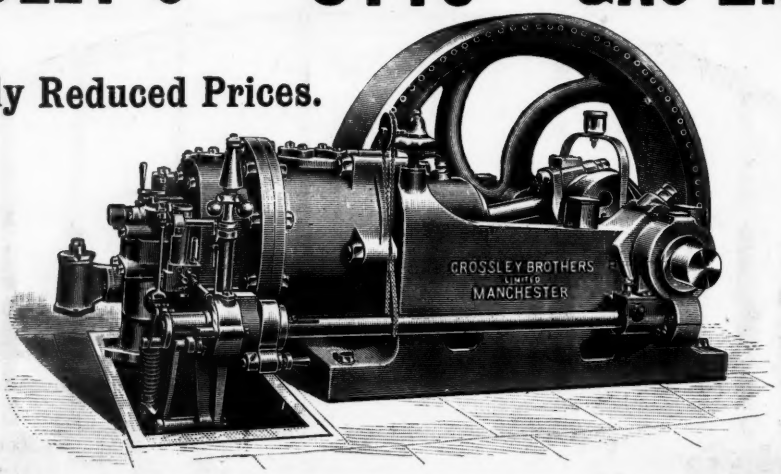
Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINES

Greatly Reduced Prices.



REPRESENTS NEW TYPE 40-HORSE POWER NOMINAL HIGH-SPEED ELECTRIC-LIGHT ENGINE.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

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FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

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GAS ENGINEERS AND IRONFOUNDERS,

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PLANT AND MACHINERY FOR GAS-WORKS.

COAL-BREAKERS. COKE-SCREENS.

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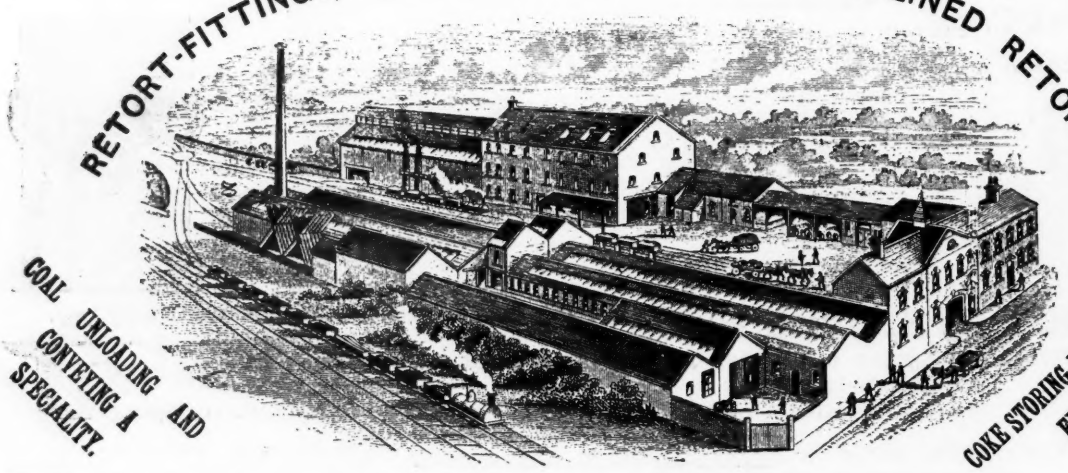

COAL UNLOADING AND CONVEYING A SPECIALITY.

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BEEHIVE WORKS, **RETFORD,** NOTTS.

WELLS' LIGHTNING PAINTER

PAINTING BY MACHINERY. GREAT SAVING IN TIME AND LABOUR.

INVALUABLE FOR PAINTING GASHOLDERS, GIRDER WORK, &c.

No. 1 Painting Machine, attached to a Single Air-Compressor, driven by Belt Power. Can be arranged with Handle for Man Power.

No. 1 Painter	£20	0	0
No. 2 „	25	0	0
Single Air-Compressor	16	10	0
Double „ „	25	0	0

No. 2 Painter may be arranged with Two Sets of Nozzles, Hose, &c., for Two Men to Work from one Machine, £8 extra.

Speed 3 Square Yards per Minute.

FOR

GAS ENGINEERS,
CONTRACTORS,
GIRDER YARDS,
BRIDGE BUILDERS,
BOILER SHOPS,
&c., &c.

AS SUPPLIED TO THE

GLASGOW,
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and OLDHAM
CORPORATION
GAS-WORKS.

Send for Illustrated Price Lists.

Special Steam Portable Painting Plant Complete, for working round Large Surfaces such as Gasholders, &c.

Price: Engine and Air-Compressor, with Boiler on Wheel Base, £90.
No. 2 Painter . . . . £25.

A. C. WELLS & CO., MIDLAND ROAD, ST. PANCRAS, LONDON. BRANCH: CARNARVON ST., MANCHESTER.

R. DEMPSTER & SONS,

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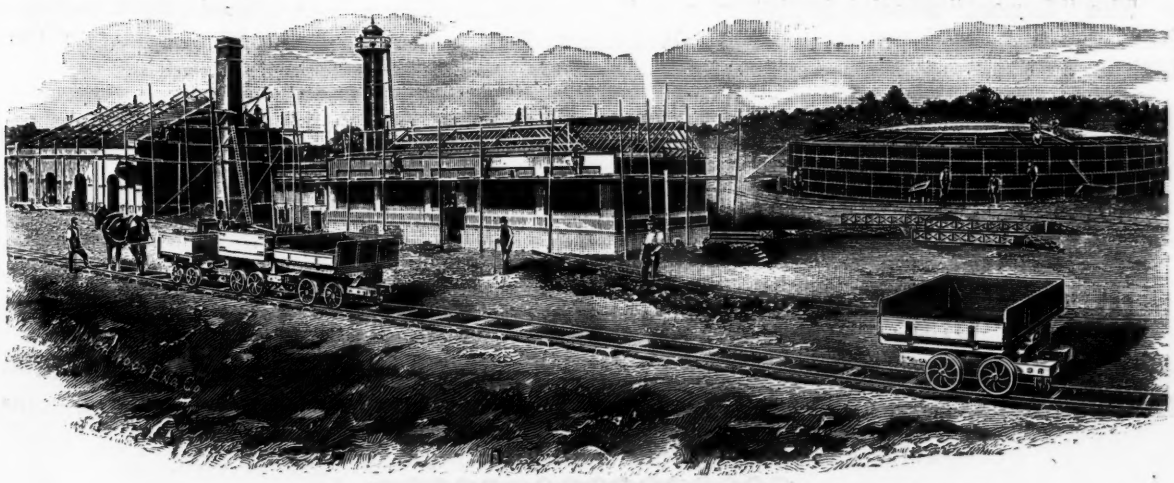
ELLAND, YORKS.

ESTABLISHED 1855. Telegrams: "DEMPSTER, ELLAND."



Engraved from Photograph of Complete Gas-Works in course of Construction.

The WHOLE of the Apparatus, Foundations, Retort Work, Buildings, and Levelling of Site have been executed by our own Workmen. No Sub-Contracts.

Estimates and Illustrations for complete Works, or for any detailed parts, supplied gratis on application.
Tenders given for all kinds of Structural Ironwork.

INCANDESCENT GAS-LIGHT

(WELSBACH PATENTS).

THE GREATLY REDUCED CONSUMPTION OF GAS

Covers the Initial Cost of the Burner in less than SIX Months.

The Prices have been REDUCED as follows:—

The Ordinary "C" Burner, price 6/6

The "C" Bye-Pass Burner, „ 7/6

Prices of other Patterns Reduced Proportionately.

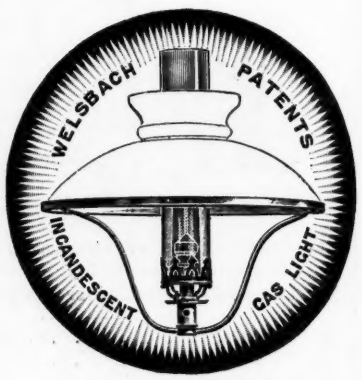
Special attention is called to

The New "Gem" Burner, price 5/6

which, with a consumption of 1¾ cubic feet of gas an hour, gives

A LIGHT OF 30 TO 35 CANDLE POWER.

This pattern is particularly suited for Domestic Lighting, and is specially recommended where it is desired to effect a large saving in gas rather than to effect a great increase in the light.



The attention of Gas Managers and Gas Engineers is called to this System of Lighting as one which tends to **Popularize the Use of Gas** as an Illuminant, owing to the following Advantages:—

Economy in Consumption of Gas, combined with High Illuminating Efficiency.

Freedom from Smoke, Dirt, and Flickering.

Greatly Reduced Heat.

The combination of High Lighting Power with DURABILITY can only be obtained by The Welsbach System.

The "Lancet" Special Analytical and Sanitary Commission, in an exhaustive report, pronounces the "Incandescent Gas-Light System" to be the **Healthiest, Best, and most Economical System of Gas Lighting.**

Suitable for every purpose of **Inside and Outside Lighting.**

Avoid the WORTHLESS IMITATIONS now being offered by UNSCRUPULOUS INFRINGERS.

OVER ONE HUNDRED AND FIFTY JUDGMENTS

and Interim Injunctions recently obtained against Companies, Firms, and Persons INFRINGING THE "WELSBACH" PATENTS, or INFRINGING THE LIMITED LICENSE under which the Mantles are sold.

FOR FURTHER PARTICULARS, APPLY TO

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COLUMNLESS GASHOLDERS

ON

PEASE'S STEEL CABLE SYSTEM.

Great Saving in Cost, and Absolutely Reliable in Working.

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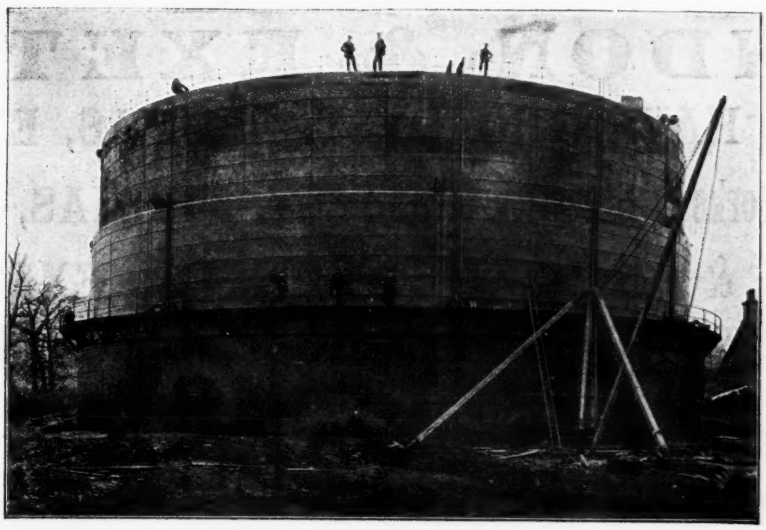
FALKIRK (N.B.)
BARCELONA (Spain)
PERTH (W. Australia)
And many other places.



Two-Lift Gasholder with Cup. Capacity, 488,252 cub. ft. Steel Tank, 135 ft. dia.; 21 ft. deep.
— FALKIRK GAS-WORKS. —
(From a Photograph)

Orders now in hand for Patent Holders for—
WAR OFFICE
FALMOUTH
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And several Private Works.

These Holders are certified by users to be STEADIER UNDER WIND PRESSURE than Holders with Columns.

INSPECTION INVITED.

Freights Reduced in Shipping Orders.

Manufacturers and Patentees, Telegrams: "GASHOLDER."

ASHMORE, BENSON, PEASE, & CO., LIMITED,
STOCKTON-ON-TEES.

THE GAS-METER COMPANY,

MANUFACTURERS OF LIMITED

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.

STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM, LATE WEST & GREGSON. Established 1830.

For Prices and Particulars apply to

R. L. ANDREWS, General Manager.

Works: 238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Address: "METER."

[See Advertisement on back of Wrapper.

WILLEY & CO., GAS ENGINEERS,

CONTRACTORS TO THE GOVERNMENT,

LONDON & EXETER.

Offices: HAVEN ROAD, ST. THOMAS, EXETER.

Engineering Works & Brass Foundries: ST. THOMAS, EXETER.

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LATEST SPECIALITIES.

WATER-GAS APPARATUS—A Model Plant in course of erection at their Exeter Engineering Works. Continuous Process; the best Results yet attainable.

COLUMNLESS GASHOLDERS—Makers of Gadd & Mason's Patent System.

Agents for the **MAXIM CARBURETTOR.**

GAS ENRICHMENT in bulk or on Outlet Main.

Makers of the **LIVESEY WASHER.**

Manufacturers of **WET AND DRY GAS-METERS.**

Their Patent **PENNY-IN-THE-SLOT AUTOMATIC METER,** admittedly one of the most perfect in the Market. Thousands in use in London and the Provinces.

Manufacturers of **GAS-FITTINGS** in endless variety—**CHANDELIERS, BRACKETS, PENDANTS, MAIN COCKS, &c., &c., &c.** **SPECIAL FITTINGS** for the Automatic Business.

Metropolitan Agent;

FRANK ACLAND, M.Inst.C.E., M.Inst.M.E., 76, Cheapside, E.C.

Telegraphic Address: "WILLEY, EXETER." Telephone 132. Established over 30 Years.

ARROL-FOULIS

PATENT AUTOMATIC MACHINERY

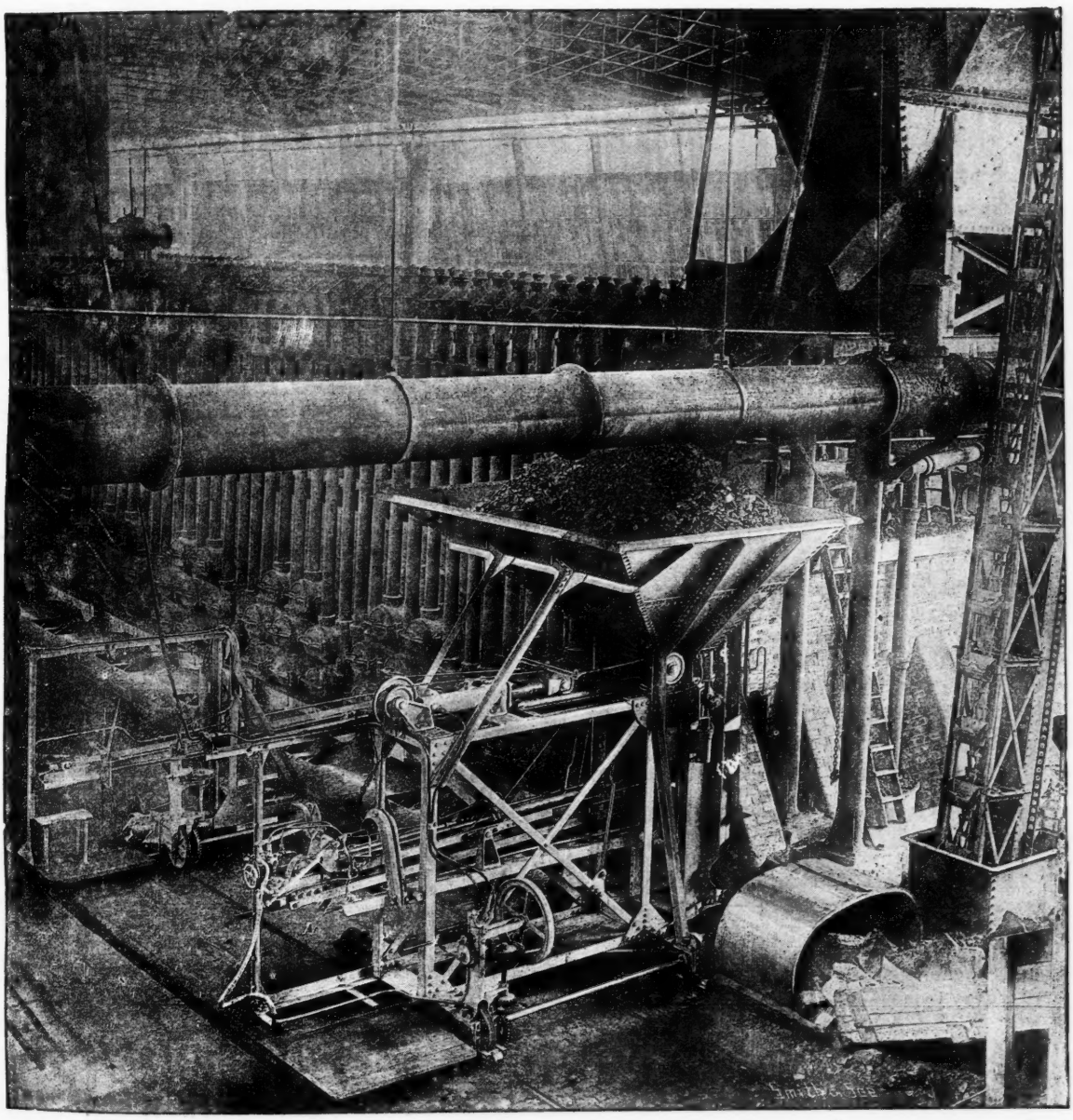
FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,

GLASGOW.

Plans and Estimates furnished on application.



The above engraving shows the interior of a Retort-House at the Tradeston Gas-Works, Glasgow, where the Machines have been at work since the beginning of 1893, drawing and charging **960 Retorts every 24 hours.**

NEARLY 200 CHARGING and DRAWING MACHINES are at WORK or in COURSE OF CONSTRUCTION.

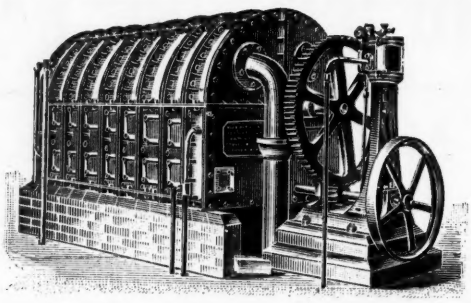
KIRKHAM, HULETT, & CHANDLER, LD.

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

MARSHALL'S PATENT COMBINED BATTERY CONDENSER AND SCRUBBER.

Extract from letter from Mr. Winstanley, of Coventry: 'The Condensers you erected for us have been in use some time, and are working very satisfactorily.'

PATENT "STANDARD" WASHER-SCRUBBER.

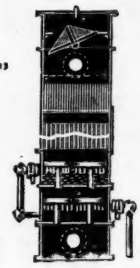


OVER 530 MACHINES

In use and in course of Construction.

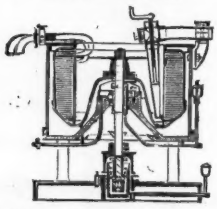
They extract all the Ammonia and a large proportion of Carbonic Acid and Sulphuretted Hydrogen.

PATENT "STANDARD" VERTICAL SCRUBBER AND TAR-EXTRACTOR.



SUITABLE FOR SMALL WORKS WITHOUT AVAILABLE MOTIVE POWER FOR MECHANICAL WASHERS.

BURMEISTER AND WAIN'S TAR-SEPARATOR.



EXTRACTS OVER 99 PER CENT. OF AMMONIACAL LIQUOR FROM TAR.

MARSHALL'S PATENT TAR EXTRACTOR AND WASHER.

Extract from letter from the Late Mr. Jaber Church: "The Marshall Patent Tar-Extractor has given very satisfactory results."

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland District Office: PRINCE'S CHAMBERS, 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHON. No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

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THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching

650,000,000

CUBIC FEET OF GAS PER DAY.

Among the Companies supplied are The Gaslight and Coke Company, the South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **FOUR YEARS.**

More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

The Enrichment is **INSTANTANEOUS** and **PERMANENT.**

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

Dealers in Carburine and all other Naphthas for the Enrichment of Gas.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

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SINCE 1893

MESSRS. HUMPHREYS & GLASGOW

Have constructed or have in hand

CARBURETTED WATER-GAS PLANT

FOR THE FOLLOWING UNDERTAKINGS:—

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Copenhagen	700,000	Coventry	600,000
Belfast	1,700,000	Bordentown, N.J.	125,000
Belfast (Second Contract)	4,500,000	Norwich	1,000,000
Glasgow	300,000	Winchester	200,000
Brussels	700,000	Holyoke, Mass.	600,000
Brussels (Second Contract)	700,000	Hoylake	125,000
Liverpool	3,500,000	Shanghai	225,000
Tottenham	750,000	Stockport	500,000
Tottenham (Second Contract)	750,000	St. Joseph, Mo.	750,000
Santiago	400,000	Lea Bridge	350,000
Swansea	750,000	Guildford	350,000
Manchester	3,000,000	Stockton-on-Tees	500,000
Brighton	1,750,000	Syracuse, N.Y.	850,000
Preston	1,500,000	Brentford	1,200,000
New York	1,200,000	Commercial Gas Co.	850,000
Southport	750,000	Bridlington	125,000
Bath	1,000,000	Middlesbrough	1,250,000
Newburgh, N.Y.	350,000	Croydon	1,250,000
Newburgh, N.Y. (Second Contract)	250,000	L. & N.W. Railway, Crewe	700,000
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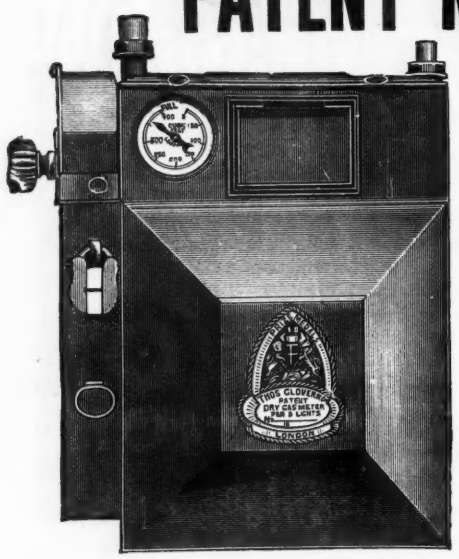

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[See also Advt. p. 808.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EDITORIAL NOTES.

An Alarmist View of Carburetted Water Gas.

It will be seen from an article appearing elsewhere that Surgeon-Lieutenant-Colonel Thomas Cayzer, of Garston, Liverpool, has taken his parable against carburetted water gas to the hospitable columns of the "British Medical "Journal," where it caught the eye of a contributor to the "Daily Graphic," who duly wrote, for the information of a trusting public of gas consumers, that the perfidious gas companies appeared, upon this unexceptionable medical authority, to be bent upon reducing the census returns by distributing gaseous poison in the guise of an illuminant. The brief editorial notes of our illustrated daily contemporary are usually pointed, and fairly well grounded; but experience ought to have warned the Editor that when a medical journal announces a new danger to public health, the allegation requires to be taken with a good many grains of salt. How many dreadful risks and injuries has the medical press discovered in the most ordinary appurtenances of civilization! Why, the thing has now become a byword. Sometimes it is pancakes; at others it is plum-pudding; then it is linen collars or high hats. According to these cheerful medicine-men, the only marvel of modern existence is that there is anybody left for doctors to kill, after humanity has run the gauntlet of its common uses and habits. Last of all, it is carburetted water gas. The professional champion of the health of Garston cannot complain that local publicity has been denied him. As a prophet, he has not been without plenty of honour in his own country. But this has not been sufficient for him, and so he has gone to the medical organ already named, under the pretence that "the danger of poisoning by the use of water gas "seems to be but little noted." We should have thought, on the contrary, that a good deal of notice had been taken of it. However, Surgeon-Lieutenant-Colonel Cayzer has thought fit to inform the professional public that they ought to bestir themselves from their apathy in this regard. He does not profess to deal with "the illuminating power, "which goes from good to bad, and to worse by clogging "the burners;" nor does he lay particular stress upon "the "deficiency of caloric." All he is concerned with is the study of water gas as "a branch of toxicology." Really, this is very dreadful. It is difficult to think of the study of gas distribution as an exercise in the science of toxicology; but the "British Medical Journal" rises to the effort in an editorial article which seems to call for more attention than the complaints of the Garston professional gentleman in respect to the deficiency of Liverpool carburetted water gas in "caloric."

Our medical contemporary observes quite truly, if not grammatically, that "gas companies and corporations all "over the country are introducing, if they have not already "done so, carburetted water gas as a substitute or partial "substitute for coal gas." Upon this the comment is made that "its use seriously increases the danger of "poisoning by gas; and the economy of production has "probably already been paid for by a very considerable "sacrifice of life." With the first half of this observation we do not disagree. Nobody who knows the facts will deny that if there is to be gas poisoning, it must be worse to be poisoned by carburetted water gas than by common coal gas. The second half of the double sentence, however, is pure assumption. Writing in the interest of the gas industry, we are free to confess that no economy of gas production would warrant the sacrifice of human life for its realization. It is horrible to talk of an industrial economy as capable of being "paid for by a considerable "sacrifice of life." The two considerations are not interchangeable, save under conditions that do not apply in this case. Surely, it is the scientific way of dealing with questions of this nature to decide them in accordance with evidence, not from prejudice. Our medical contemporary appears to have tried to ride both horses. In one place it observes that "in the absence of comparative statistics "and of definite information as to the composition of the "gas actually supplied, it is hardly possible to arrive at "any satisfactory summing up of the facts of the case;" and in the very next lines it abuses gas companies and corporations roundly for rendering their lighting gas "more and more poisonous, as they are undoubtedly "doing at present." May we refer our contemporary to another professional witness, Dr. Campbell Brown, also of Liverpool, who has recently put upon record a

statement that, "in order to form an opinion on the suitability of carburetted water gas for the general purposes of domestic use, certain data would be necessary which have never yet been published." This is exactly our own position. We refuse to regard as convincing any evidence that has yet been offered on the hygienic aspect of carburetted water gas, as supplied in the ordinary way for town use. It is true, of course, that people who inhale a sufficiency of this gas will die; but so they will if they breathe enough ordinary coal gas. The whole question is one of degree; and, so far as we can see, of degree only. How the degree works out, however, is precisely what we, in agreement with Dr. Campbell Brown, refuse to form a definite judgment upon in the present state of knowledge. A question upon this subject was asked in Parliament on Thursday; but only to reveal the usual official ignorance of matters which do not immediately affect departmental interests.

The Commercial Gas Company and their Capital.

THE half-yearly meeting of the Commercial Gas Company last Thursday was of the usual character; and the small assembly of proprietors had every reason to be satisfied with the explanation as to the trading and financial position of the undertaking offered by the Chairman, Mr. John Blacket Gill, whose normal condition of mild melancholy did not damp the cheerfulness of shareholders met for the purpose of declaring a handsome dividend and authorizing the issue to themselves of further capital at par. As we remarked last week, this new capital issue was really the only prominent feature of the business before the meeting; and all that it is necessary to say is that the outcome of the proceedings was to place the Board in the position they desired, of being able to issue such additional share and debenture capital as they think proper at such time as they may deem expedient in accordance with the Company's Act. No other solution of the question of the new issue was expected. At the same time, the exceptional nature of the capital powers possessed by this particular Company was recognized by the Board, who obtained a special report from their Secretary on the bearings of the whole question. The fact is, as the Chairman told the meeting, that no other gas company in the United Kingdom now has the power to issue fresh capital at par to present shareholders. The existence of this right in the Commercial Company's case is unquestioned. Further, as the Chairman observed, at the time when the Company obtained this power—they really being the first who were wise enough to accept the sliding-scale, for which they were rewarded by escaping the auction clauses which ever after were imposed upon gas companies—it was believed that the exception was a benefit to be thankful for. Later it came to be thought that the supposed boon was "no great catch" after all; and at the present time there is a very formidable bulk of expert opinion in favour of the view that it is a positive disadvantage to a company. We may say at once that we participate in this judgment; while remaining free to admit that it is by no means clear how matters should be mended. What, for example, is the degree of the interest attaching to the existing shareholders in the proposed new issue? As stated by Mr. Gill, the old shareholders will be offered about 5 per cent. on existing holdings. This is something, of course; and, whatever it is, we are not going to say that the shareholders are not entitled to it in every way, or that the Directors would be justified in dealing with the issue otherwise than as they propose to do. At the same time, however, it is impossible to shut one's eyes to the fact that the new capital, which is so badly needed, costs the Company dear. Every other gas undertaking in a similarly prosperous state is able to obtain at something between 3 and 4 per cent. whatever additional capital is required for its development; and, owing to the superior earning capacity of gas-works extensions in comparison with the older establishment, the more of this cheap capital that can be profitably employed, the more secure of maintenance are the old dividends. This is perfectly obvious. On the other hand, when all additional capital has to be obtained upon the Commercial terms, though the shareholders derive an immediate and apparent benefit by being presented with a substantial bonus, the fact of the undertaking having to bear the burden of this bonus, without deriving any benefit from it, renders the maintenance of the dividends upon the old capital more difficult with every fresh issue. And as the major interest of the proprietary is in the old capital, it is this preponderance that should determine their policy in regard to their dealings with the undertaking as a whole. In the instance in point, the Board have been working of late with the assistance of a temporary loan from their bankers, for which accommodation they may have paid 3 per cent. When they square their capital account by the issue of additional stock and debentures, this will cost the undertaking, on an average, more than twice this rate of interest. It is all very well to put it upon the Engineer and Manager to make good the difference; but, able as Mr. H. E. Jones undoubtedly is, he cannot work impossibilities, or make 6 per cent. capital go as far (say) as Mr. Frank Livesey over the water can his cheaper money. The Commercial Gas Company's capital is proportionately small; but unfortunately it is all dear. We cannot but think that if the Directors, with their large holdings, would consider this point; not as a Board, but as shareholders, they would appreciate the argument that it is better for them to develop the undertaking with cheap capital, than to burden it with capital costing more than it is worth in the market.

Mr. Samson Fox "Libelled"

IN the Queen's Bench Division, on Wednesday last, Baron Pollock and a special jury commenced the hearing of a remarkable libel action brought by Mr. Samson Fox, of Leeds Forge and Water-Gas Companies fame, against Mr. Jerome K. Jerome and other defendants responsible for the publication of the journal called "To-Day." So long ago as March 12, 1894, with reference to the opening of the Royal College of Music by the Prince of Wales, when Mr. Samson Fox was held up to admiration as a public benefactor on account of his gift of £45,000 to the building fund of the institution, there appeared a scathing libel upon him in that publication. Of the serious nature of the libel there can be no question. In it Mr. Samson Fox was likened to the notorious Baron Grant; and it was asserted that in the year 1889 he, in association with Messrs. John C. Cottam and others, was instrumental in bringing out a series of bubble companies with a total capital of upwards of £1,350,000, out of which £1,130,000 was to pass to the promoters, and all in the brief space of sixteen weeks. It was asserted in so many words that Mr. Samson Fox's subscription to the College of Music was drawn from the public by gross misrepresentations. The libels were repeated week after week; and when the subject of them took action against those who were in the eye of the law responsible for their publication, the defendants pleaded justification. It is unnecessary here to remind our readers of the history of the water-gas speculation of 1889, all of which is to be found recorded in the "JOURNAL" of the time. Neither is it possible at present for us to discuss the case, which will probably turn out to be one of the heaviest of its kind ever heard in the Royal Courts of Justice. In our "Legal Intelligence" to-day will be found a condensed report of the proceedings, prepared with special reference to the technical aspects of the case, with which alone we are particularly concerned. Great interest is being taken in the action by the financial and general public.

The Works Department of the London County Council.

GAS Companies and Corporation Committees interested in the great question of the abolition of the middleman in the execution of works may study with advantage the experience of the London County Council in connection with their now notorious Works Department. It is unnecessary to recapitulate the causes that led to this notoriety. In November last, a Committee of the Council was appointed "to inquire into the management and financial position of the Works Department since its inception, and as to its future prospects;" and the report of the Committee, to be considered at to-day's meeting of the Council, has been published. It appears that the accounts of the Department show "fabricated entries" to the amount of £7229. This does not mean that the Council had been robbed by a corresponding amount, but only that false statements were prepared by transferring part of the cost of some works to others, with a view to the improvement of the apparent working results of the Department as a whole. This practice is reprehensible; but, on the other hand, it does not need much acquaintance with the methods of working of concerns of the kind to teach one that very much the same sort of thing is pretty extensively practised.

The question of degree comes in, of course, to qualify the point of principle; but the whole business is of a nature that does not readily submit to pedantic criticism. Some of the gas-fitting work executed under the Department is specially mentioned as having been manipulated in the works accounts. It is very sad to find the London County Council hoodwinked in respect of the true cost of various gas-fitting jobs carried on simultaneously; but the result will not surprise those who have had much to do with so uncertain a line of labour. In undertaking to do building and other work on their own account, the County Council entered upon an experiment which, as the Committee observe in their report, is probably practised by other municipal bodies and statutory companies to a greater extent than is generally supposed. But the experiment was complicated in this case by the adoption by the Council of very strong views respecting the principles involved in dispensing with the middleman. The Council desired to pose as the model employer, with the result that the Department did not succeed in producing an example of a model staff and establishment. This is only what a cynic would have expected; for, human nature being what it is, the importation of any other than strict commercial principles into commercial transactions is likely to spoil the business results without achieving any commensurate success of another kind. This is really the lesson and the warning of the Works Department "scandal." Safe 5 per cent. philanthropy has never been an easy cause to carry through. It is not a bad ideal, as ideals go; but those who undertake the responsibility of working it must be prepared for disappointments which will rarely be confined to one side of the issue.

Mr. Robert Shaw on the Petroleum Trade.

Interesting evidence was given last week before the Select Committee of the House of Commons on the Petroleum Act, by Mr. R. Shaw, the Manager of the Liverpool branch of the Anglo-American Oil Company. This is the English offshoot of the Standard Oil Company; and consequently Mr. Shaw represented on this occasion one of the best-abused commercial organizations in the world. He told the Committee that the Company of which he was the apologist had more than a million sterling sunk in plant, machinery, and transport appliances for supplying the United Kingdom with lamp oil. During the year 1896, the oil importation of the Company amounted to 106,158,061 gallons, which came by the incessant service of six ocean tank-steamers, and was distributed from 207 depôts by means of 290 railway and 413 road tank-waggons. The witness claimed to have thirty-six years' experience in the distribution of burning oils. For six or eight years he dealt exclusively in Scotch oils; but he was "led to "turn his attention to American oil because of its superior "burning qualities and its greater freedom from smell." If Mr. Shaw had added the further explanation that he went into the American oil trade because he saw there was more money in it, the story of his life's experience would have been rendered much more convincing, without casting any reflection upon his own integrity. He told the Committee that, with the exception of an unfortunate fire in Huddersfield last year, brought about by a combination of conditions and gross carelessness on the part of workmen, he had never, during the whole of his experience, had an accident from fire arising from the storing, carrying, or handling of petroleum. He also said that, while fully awake to the necessity of giving ample protection to the lives and property of the people, he was of opinion that no further petroleum legislation is necessary. This opinion was based upon the belief that petroleum, if handled with ordinary care, is a perfectly safe article of commerce; which faith is in turn supported by the witness's long experience in the trade and immunity from accidents, and on Sir V. Majendie's statistics. Dealing with the altered condition of the petroleum trade of the country which has been brought about since the Anglo-American Company undertook to create its monopoly, Mr. Shaw averred that since the advent of the Company's "bulk system" speculation in lighting oil has ceased. The enormous piles of oil-barrels that used to be seen everywhere have vanished, for the most part, with consequent reduction of the risk of fire. The witness did not volunteer any observation as to the effect of the new system upon the price of oil. He declared, however, that the mere raising of the flash-point of burning oil from 73° up to 100° or 120° Fahr. would not, in his opinion, diminish the number of lamp accidents, while it might, by encouraging the use of a heavier oil of more sluggish burning properties, tend rather to increase than to decrease them. The witness said "the great majority of lamp "accidents arose from gross carelessness in handling the "oil, and the wilful or accidental overturning, while lighted, "of lamps with breakable founts. In all such cases, the "result would be practically the same, whether the oil "flashed at 73° or 120°." Mr. Shaw also stated that to raise the flash-point of oil would materially enhance its price. Generally, he thought the oil trade does not need further legislation.

WATER AND SANITARY AFFAIRS.

The terms of reference to the Royal Commission on the London Water Companies, as announced by Mr. Chaplin in the House of Commons last Tuesday, are both comprehensive and well defined. The question of purchase comes in first, coupled with the consideration whether such a transaction is desirable in the interests of the ratepayers and water consumers. If purchase is thought advisable, then by whom are the undertakings to be acquired and managed—by one or by several authorities; and, further, who should be such authority or authorities? It will be observed that there is nothing prejudged in this putting of the case, though such throwing open of the question admits a decision in favour of the "one authority and one area." Whether, on the other hand, it is possible and desirable to effect a physical severance of the works of the various Companies, together with the sources of supply, is a matter for the Commission to investigate—an inquiry which has evident relation to proposals for placing the outer areas by themselves. So far, all has reference to purchase, and includes the mode of treating the territories, whether by combining or separating them. Supposing the Commission to come to a decision adverse to a transfer, there arises the question of control. Are additional powers for this purpose desirable? If so, what are they to be, and by whom are they to be exercised? Having directed the attention of the Commission to the critical points of purchase and control, there comes in the third place something like amalgamation, or at least a blending of the supply in the case of two or more of the Companies.

In dealing with purchase, the instructions to the Royal Commission require that regard shall be paid to financial considerations, together with the future demands which await the Companies. Apart from the financial element, this portion of the instructions seems a little to encroach on the domain traversed by the Royal Commission of 1892. But it is significant that finance takes the foremost place in the programme. It is on this point that the County Council have enlightened us so little, and the subject happened to be one which lay outside the range of Lord Balfour's inquiry. Yet it is the very topic on which the ratepayer is naturally sensitive; and it may happen that the coming Commission will speedily discover that, if the ratepayer is wise, he will let the undertakings remain where they are. Whatever may prove to be the outcome of the inquiry, it is tolerably certain that the members of the Commission will find work enough to occupy them for some time, much to the discomfiture of the Progressives, who cannot afford to wait, and who look upon delays as dangerous. The "Daily Chronicle" sees in the plan of the Royal Commission a further development of the "plot against London." The connection of two or more of the different systems of supply now existing in the Metropolis is looked upon as a gigantic scheme of amalgamation, calculated to make the water monopoly impregnable for the next half century. We so far agree with our contemporary that for a considerable period we have argued that, if the Water Companies were to amalgamate, they would greatly strengthen their position. As for an interchange of supply, that might be provided for without merging one Company in another. We have a further view of the instructions to the Royal Commission in the columns of "London." But the reference is so brief that we get little from it. The most we can learn is that the "solution of the problem" is further postponed. This solution appears to consist in giving the Council absolute possession of the water supply. But the ratepayer would like to know how the bargain is

ikely to affect his pocket. He hears of microbes, but his alismanic word is money. The microbes are infinitesimal; but the rates are not so.

Mr. George Banbury could not fail to deliver a speech of interest and importance when presiding at the half-yearly meeting of the East London Water Company last Thursday. Speaking as the Chairman of the Company, he made no demur to the appointment of the Royal Commission on the subject of the water supply, presuming the members of the Commission to be qualified for their task. Neither did he object to the formation of a Board to which consumers could apply for a redress of grievances, real or supposed. All that the Water Companies required in such a case was for the Board to consist of men of repute with open minds. A kind of suggestion seems to have lurked in this part of the Chairman's speech, to the effect that the Company had perhaps more need of an authority in redress of grievances than the consumers. But if complaints are to be levelled against any of the Metropolitan Water Companies, the latter find their surest defence in a competent tribunal. The Hackney inquiry, conducted by Colonel Ducat and Dr. Barry, exonerated the East London Company from the charges brought against them relative to the diminished supply of water in the summer of 1895; and the President of the Local Government Board, speaking in the House of Commons, endorsed that judgment. Parliament in 1894 had to pass the Company's Bill which had been rejected in 1893; while the Purchase Bills of the London County Council have been rejected in two successive sessions. Amid the bitter attacks and unfounded aspersions levelled against them by the Progressive party, the East London Company are giving practical proof that they wish by all means to secure an adequate supply of water for their district. The two new reservoirs sanctioned by the Act obtained in 1894 have been taken so vigorously in hand that one is now ready—having been completed ten months within the contract time; while the other will be finished with six months to spare. How the demand for water grows is shown by the circumstance that during the half year the Company have laid on water to very nearly 3000 houses. It is also of importance to note that five-sixths of these houses are outside the Metropolitan area. How little the Water Question is understood—at least in certain quarters—is indicated by the circumstance that the East London Company are said to sell water at a dearer rate than prevails at the West-end. The truth is the very reverse; the net water-rates of the East London Company per 1000 gallons being less than those of any other Company, and very much below the amount received by the Chelsea, New River, and West Middlesex Companies. What the humbler classes have to expect from the London County Council as a water authority it is difficult to apprehend, seeing that in the East London district the supply to many thousands of small tenements is being given at a dead loss. This is coming tolerably near to "free water for the people."

In a letter to "The Times," Mr. Crookenden, at the instance of the East London Directors, very properly asserts that it is simply a waste of time and paper for Mr. Shaw Lefevre to reproduce arguments and assertions which have long been refuted after full examination. It is seemingly impossible to remove from Mr. Shaw Lefevre's mind the hallucination that Mr. Bryan, when giving his evidence before Lord Balfour's Commission, declared that the East London district, apart from all question of works, was fully provided with water for a number of years to come. It is perfectly certain that the Royal Commissioners never understood Mr. Bryan to say anything so absurd. The provision of additional storage reservoirs formed the very basis of their recommendations with respect to the East London water supply; and such an extension clearly formed part of the Company's plans. But what is to be said of "London," which calmly declares that the whole evidence laid before the Royal Commission in 1893 was intended to prove that there was no need for immediate and large works? The Royal Commissioners are stated to have heard such evidence, and to have accepted it; leaving Mr. Shaw Lefevre, as President of the Local Government Board, "no alternative "but to do the same." We must conclude that neither Mr. Shaw Lefevre nor his supporter in the columns of "London" has ever read the report of the Royal Commission, or the evidence on which it was founded in reference to the East London supply.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 792.)

ANOTHER week has gone by, and still the general position of affairs in the Stock Market has not undergone any material change. The Eastern difficulty drags on as if it were to be interminable; and the upshot is not much, if at all, clearer now than it was a week ago. So the public remain reluctant to touch anything with a spice of speculation in it, and seem resolved to wait a little longer. The markets thus keep very quiet, and for the most part depressed, with an occasional flicker of revival now and then when "bears" close accounts. With exceptions here and there, prices show a decline, though not to any great extent. Rails were a little shaky on labour questions; but in general the choice investment stocks were in good demand. Money was abundant and cheap, and looks like becoming cheaper still if peace be preserved. [The words "great ease" in relation to the Money Market were inadvertently last week printed "great rise."] In the Gas Market, transactions were numerous and extensive; and the general tendency was decidedly weak. But it is to be noted that at a large sale of stocks—mostly debenture and preference—at the Mart on Wednesday, there was a brisk demand at better than quoted prices; and the quotation of some of these has since advanced. Gaslight "A" was shaky, opening at 310 on Monday, and falling gradually away down to 302 on Friday; but Saturday's closing price was rather better. The secured issues were strong and active, and some of the preferences advanced in value. South Metropolitan was more freely offered; and the price shrank till business was done at 142½. Commercials were quite untouched. At the meeting on Thursday, the exposition of affairs gave much satisfaction; and the proprietors voted with alacrity an increase of 10 per cent. on the capital—half in stock, and half in borrowed money. It is five years since the last small issue of debenture stock was made; so it must be acknowledged that they exercise their privilege with commendable prudence and self-denial. The Suburban and Provincial Companies were only noticeable for a rise in Brighton, influenced by the sale at the Mart. In Continentals, Imperial was offered, and the price dropped away till 206½ was touched on Saturday. None of the rest presented any particular feature. Water stocks were quiet, and inclined to be weak. A few slight variations took place in the quotations; and they were downward.

The daily operations were: Dealings in Gas were fairly active on Monday—confined almost exclusively to the big issues. Prices inclined to be easier; and Gaslight "A" and Imperial Continental fell 1 each. In Water, Grand Junction lost 1; and Southwark, 2. Transactions in Gas were similar on Tuesday; and the tendency was the same. Business on Wednesday was entirely in the three big issues; and they all receded. Gaslight "A" falling 2; and South Metropolitan and Imperial Continental, 1 each. Thursday was rather quieter; the tendency still being weak. Imperial fell 3; and Gaslight "A," 2. But Gaslight "K" rose 2; and "C," "D," and "E," 1; and both Brightons, 3. Friday was a very active day, especially in Gaslight "A," which fell 1 more. Lambeth Water was 1 lower. Business was quiet on Saturday; and prices did not move.

ELECTRIC LIGHTING MEMORANDA.

The Affairs of the Metropolitan Electric Supply Company—The Free-Wiring Company—The Scarcity of the Polyphase Motor.

THE tenth ordinary meeting of the Metropolitan Electric Supply Company has been held under the presidency of Sir Eyre M. Shaw, who succeeded the late Sir John Pender in the chairmanship of the Company. The address of the new Chairman contained several interesting points, some relating to the special affairs of the undertaking, and some of a more general character. Among the latter may be mentioned the election to the Board of the Company's Engineer, Mr. Frank Bailey, in the capacity of "Engineering Director." We beg to commend this new feature of Company administration to the consideration of Mr. George Livesey, as constituting a variant upon his favourite idea of Workmen Directors. Sir Eyre M. Shaw, in announcing to the meeting the change that had been effected in Mr. Bailey's status, remarked that his connection with the Company had been a long and an honourable one; and the Board believed they had taken a wise and prudent step in securing his closer identification with the concern. This is very well for one view of the matter; but there are certain to be those who will maintain that the deliberative and executive branches of company control ought to be kept distinct. The Metropolitan Company have a great and growing business, which appears now to be upon a sound technical basis. The system of electricity distribution by means of transformer sub-stations now employed by the Company has practically been created and developed since the undertaking started; but the change from the original separate consumers' transformers has been effected without much disturbance. One of the mistakes of the Company's callow youth—

the experiments to work a central supply station entirely with American plant—was satisfactorily terminated by a beneficent fire; and now everything in the engineering equipment is in high order. The increase of revenue for the past year, though considerable, was not quite so large as during the previous year or two; which goes to show that the undertaking is approaching the saturation-point for the existing connections. This consideration has not been overlooked by the Board, who confess, through the Chairman, that the question of what arrangements are likely to be required to meet the responsibilities of the undertaking in the future is greatly exercising their minds. Up to the present, and for a short time longer, any increased demands for current can be supplied by adding to the capacity of the existing plant; but nobody can say what a few years may bring forth. Before accepting fresh responsibilities by calling up capital for the creation of new stations, the Directors naturally wish to know what amount of increased demand the future will bring; and this is just what is most difficult to determine for any kind of supply undertaking from the moment when a "decremental rate of increase" manifests itself in the returns. It is to be regretted that the Metropolitan Company should be hampered with founders' shares, which are quite out of place in connection with statutory undertakings of this importance.

A question put to the Chairman at the close of the meeting was as to the relations of the concern with the Free-Wiring Company. It appeared from the official reply to this query that the Company in question had been in correspondence with the Board, together with all the other London Electric Lighting Companies, with the object of procuring a monopoly of the fitting up of houses for electric lighting. Possibly, the penny-in-the-slot electric lamp enters into the same proposals. The Metropolitan Company, at any rate, have not yet seen their way to bind themselves to the Free-Wiring Company; but negotiations are still going on between the two Companies, from which it is hoped that something will eventuate. What is this Free-Wiring Company? Who are they, that they should be spoken of at this particular meeting as it were "with bated breath"? It is not usual for companies or individuals in any sort of electrical business to efface themselves, or attempt to "do good by stealth." Quite the contrary, one generally hears far more as to what is about to be done in the electrical line than is justified by the achievement. Yet here is the sound of a concern that proposes to engage in the stupendous undertaking of wiring all London for electric light; and nobody connected with it has ever read a paper, or delivered a course of lectures, or been interviewed by an appreciative newspaper reporter, or taken any other of the approved modern short-cuts to notoriety. There is something uncanny in such modesty.

There is a decidedly pessimistic tone about the comments offered by the "Electrician" upon Mr. W. B. Esson's recent paper at the Society of Arts on "The Transmission of Power by Alternating Currents." This is the only serious public statement of the facts of contemporary practice in this regard that has been available since the transmission of power in large amounts by this agency has been understood to have been accomplished at Niagara and elsewhere. Yet it is to be gathered from our contemporary that the facts communicated do not signify much. The average Briton hears of great things being accomplished in different places by alternating, or polyphase, currents; but so long as the Metropolitan Railway continues to be worked in the customary offensive manner, by steam locomotives, he is apt to think there is nothing in the story to particularly interest him. The "Electrician" admits that electrical transmission of power on a large scale somehow does not make itself at home in this country. In other parts of the world, strangely enough, polyphase electrical power distribution is a great fact. "Both in the amounts of power dealt with, and in the distances over which power is conveyed, polyphase currents are accomplishing far more than any other means of power transmission known to the civilized world." This is truly remarkable; and there do not appear to be any very intelligible and sufficient reasons for the circumstance; because, of course, the Highlander's account of the reason why bigger salmon were always caught in another fishery than his own cannot apply in this instance. There are no "bigger leears" to be allowed for in this connection. Our contemporary observes upon this head: "Probably there are many reasons; at least, almost everybody one asks about the matter gives a different reason. Some hint at difficulties with regard to patents; some believe that there is only a very limited field for electric motors, and one not sufficiently large to justify power supply concerns in adopting a special class of generator and separate mains for them; but in all probability the most potent of all reasons is the fact that in this country we do not need to transmit power over great distances for use in large units. We have no large waterfalls, the power of which might be sold at a distance at a price capable of competing successfully with coal; we have no inducement—at any rate, we see none as yet—to convert the energy of coal into electric energy at the collieries, and to transmit it electrically to the great centres of industry." And, most unfortunately for the electric motor, where it might answer somebody's turn in a small way "there is usually the competition of gas-engines, oil-engines, and hydraulic motors—forms of motive power so cheap and serviceable as to render it improbable that the polyphase motor will be very generally used for some time to come. Indeed, this fact is well understood by the alternate-current electric supply concerns in this country, who have turned their attention almost exclusively to lighting, and have never shown the least indication of an intention to lay mains for the supply of polyphase currents for motors. They know well enough that such a plant would not pay." This is the question. People in this country needing power for any purpose know too well at what cost they can get it from other sources to lend much encouragement to electricians to experiment at their expense.

IN THE CAUSE OF CLEANLINESS.

An amusing little article, entitled "Municipal Spring Cleaning," appeared in a recent number of the "Daily Graphic;" and as the writer has a good deal to say on the subject of street-lamp cleaning, we notice his observations here as indicating the aspect in which one of the routine cares of gas distributing engineers strikes a member of the public. The article commences with the reflection that domestic spring cleaning just now "holds the heart of woman;" and the suggestion follows that it would be a good thing if those who are charged with the custody of London and other British cities shared this praiseworthy pre-occupation. It is quite true that London and other populous places in England are habitually "musty and dowdy." We have argued on previous occasions in favour of the extension of the ordinary work of town cleansing to objects hitherto excluded from the scope of these operations; and we gladly welcome the assistance of the daily Press in furthering this cause. Advocacy without discretion or discrimination, however, can only be injurious to the cause which it is intended to assist; and we regret that, in his onslaught on the superfluous dirt in London, the "Daily Graphic" writer has been more than a little unfair to the street-lighting service. He says upon this branch of the subject: "There scarcely lives a woman with a soul so dead to housewifery as not to have longed from her earliest youth to scale the heights of London gas-lamps, and wear out some wholesome energy and much wash-leather in polishing the panes through whose duskiness the City receives her light. True, the lamplighter goes his periodic rounds—not on horseback, as he does in Chicago—smearing, perhaps, a hundred lamps with what he calls a "duster," a small shred of grimy linen the size of a postage stamp. Any elementary maid-of-all-work could tell him that a district well provided with street-lamps needs something like an acre of glass cloth to polish their panes so that sufficient brilliance may be reflected to light the citizens comfortably on their ways." The good intent of this passage is obvious; but so also, unhappily, are its incorrectness, injustice, and ignorance of the facts.

Let us straighten this matter out before going any further. The service of the street lighting of London is the subject of contracts made and revised from time to time between the Gas and Electric Lighting Companies and the Local Authorities. To take the City of London as an example, the street lighting is shared by The Gaslight and Coke Company and the City of London Electric Lighting Company. There is no question here as to the price of the lighting itself; but in regard to the care and cleaning of the lanterns, all this comes under the head of "lighting and repairing," which stands the City in 18s. per annum for a square lantern, and 22s. 3d. for a round one—the increased charge in the latter case being due to the greater cost of the bent glass required. In some parts of London, pot-shaped street lanterns, made of glass in one piece, are used very sparingly; but the pattern, which seems to be a favourite one in some localities, has never taken well in London. The inspectors of street lighting see, among other things, that the lanterns are kept clean; and we have no hesitation in stating that in no city in the world are cleaner street-lamps to be seen than those of London. The service is equally well done in many provincial cities and towns; but there are localities, it must be admitted, where dim or smeary street-lanterns are only too conspicuous. It is all very well to be funny over the hypothetical use upon the street-lamps of London of "a small shred of grimy linen the size of a postage-stamp;" but the description is not true. Nothing but the best wash leather would serve the purpose, as a writer so expert in matters of housewifery ought to know. He, or she, would be surprised to know the number of bales of cleaners that are worn out yearly upon the lamps of London. A high standard of cleanliness in this regard is set as the result of rivalry of the public and private street-lamps, which combine to brighten street corners and the thoroughfare before houses of entertainment and business. The London publican is a particular man in respect to the state of his ornate and enormous outside lamps; and street-lanterns must be well looked after, unless they are to compare most unfavourably with his scheme of illumination.

All this, of course, refers to the lamp glass alone. When it comes to the state of the lantern framework and the columns, we must confess that London, and, generally speaking, all British towns, have much to learn from Paris and other Continental cities. Our street-lamp columns are carefully painted once a year; and for all the rest of the time they are left foul with dust and mud. This is where London shows itself so "desperately and undeniably dirty," to quote its latest critic. In the City and certain main thoroughfares—as the Strand—the street surface of wood or asphalte is washed clean every night; and street

orderlies are busy all day long keeping the roadways and pavements as clear as possible of filth and the nameless consequences of the passages of the heaviest vehicular and foot traffic in the world. Shop fronts—apart from the glass—pillar letter-boxes, railways, monuments, all standing objects, in short, which take the multitudinous splashings of the roadway and harbour dust, are left in grime. One striking result of this indifference is the dowdy, second-hand appearance of London on Sundays and summer evenings, when the shops are shut, and there is nothing to look at in the streets but the streets themselves. "For the streets, the railings, and the boardings of London are sickly with the dust of decades;" though it is rather a far-fetched presumption that "femininity yearns to invest these with the sweet-smelling soapsuddy aroma belonging by all tradition to this season of the year." London is far beyond any such possibility as is here indicated; but there is no valid reason why it should not be made and kept a great deal cleaner and sweeter than it is. But there must be a great awakening of both the municipal and the shop-keeping conscience before any such result can be brought about.

The funny thing about all this is that a people with so highly-developed a sanitary sense as the English should rest content to live in such superficially dirty towns. We have carried our arterial and house drainage systems, and our water supply, to the highest attainable pitch of practical perfection. There is no city in the universe so absolutely free from "smells" as London has been since the purification of the Thames was seriously taken in hand. It has been said that every European city has its own characteristic odour, and some are proverbially endowed with a number of these attributes; but the only real "smell" of London is that of coal smoke, which clings to the clothes and luggage of those who sojourn within its borders. English towns, however, do stand undeniably in need of a thorough washing and scouring, such as they would get in Holland. We are accustomed to ascribe all the blame for the dinginess of our towns to coal smoke; but nobody seems to think how much brightness would be restored to our streets, despite the smoke, if we would only wash the frontages. The smoke cannot be helped. Indeed, to those who can see it aright, the smokiness of the London atmosphere is charged with beauties of its own. Everyone who has noticed the scene must have recognized how smoke heightens the majesty and the mystery of that wonderful panorama of the river between the bridges which is one of the sights of the world; but there is no redeeming feature in the soot and dust of the street façades.

The "Daily Graphic" writer suggests jocosely that there should be a Woman's Committee on Cleanliness formed as an offshoot of the London County Council. Women have made themselves conspicuous before now as self-appointed leaders of "Purity Crusades;" but material cleanliness is not a cause that has ever commended itself to the appreciation of the platform variety of the sex. This may be a great pity; but the fact remains. It does not appear that any new organization is required to procure the better cleansing of towns—only that the need should be perceived and recognized. To this end, the first step to be taken must be the creation of an enlightened public opinion.

Perhaps it may be of assistance in this regard to cite the example of the administration of the City of Paris. Chapter 3 of the treaty of 1870 between the City and the Paris Gas Company, relates to public lighting; and it declares, among other things, that all lanterns and their supports are to be supplied by the City and fixed and painted by the Company, "in accordance with tints indicated by the Prefect of the Seine." The Company have to maintain all the lighting appliances in good order, and are responsible save in the case of *force majeure*, for all accidents, damages, and thefts of these materials. It is also enacted that the Company are to completely clean the lanterns every day. This cleaning must be finished at least an hour before the time for lighting. Between the 25th and 30th of every month, the lamp-posts are to be washed from top to bottom; and those lamp-posts that are bronzed must be washed and waxed in such a fashion as to keep them always in a proper state. Fresh painting is to be done whenever the Prefect of the Seine thinks fit to order it. A payment to the Company of 4 c. per lamp per day covers everything, in the case of plain lamps of the ordinary pattern. A fine of 1 fr. per day is leviable for default by the Company in carrying out these requirements. The terms of the treaty are rigidly enforced. Incessant tours of inspection are made by the agents of the administration; and in order that there shall be no dispute as to the facts, they are always accompanied on their rounds by lamplighters in the Company's service. It is altogether contrary to the French spirit to neglect the cleaning and polishing of ornamental lamp-columns which cost a great deal of money. In England, the most elaborate of castings of this order are painted once a year, and then left to dirt and detriment. In Germany, Belgium, and Holland, the street-lamp posts are generally well taken care of.

Improvement in this branch of sanitation will only be obtained by well-directed and persistent agitation. It is a common thing for travelling English people to protest that the vile odours that haunt old Continental towns mar their enjoyment of the picturesque aspect of these places. Such critics of Continental ways are often heard to lament that drainage is so little understood by European municipalities; that even the Town Halls and other important buildings are commonly destitute of the most elementary provisions in this regard. But we have yet as a nation to learn that dust and air-borne dirt in towns may have their own victims. To judge from advertisements, we should be the greatest users of soap in the world; but no foreigner would think so from the indications presented by our streets. The whole subject of street cleaning—not confined to sweeping and road washing—calls for attention at the hands of English sanitarians. We discussed the matter some time ago, urging that a beginning should be made, and an example set, by the street lamp-posts; but we have not heard anything about it since, until the appearance of the timely diatribe in the "Daily Graphic." We should be glad to hear from any correspondents who can testify that the cause of cleanliness is making headway in this respect anywhere, and will put the question now of which is the best cleansed town in the United Kingdom? Can anybody help to establish the reputation of his own neighbourhood upon this basis?

CLERK ON THE GAS-ENGINE.

THE appearance of a new and revised edition of Clerk's standard work on internal combustion engines* is to be welcomed. It is more than ten years since the first edition was published, and it was immediately recognized as the best text-book on the subject that had been put into the hands of students. Ten years is a long time in the history of modern engineering; and during this period the original work of Clerk has been crowded into the background by several later books devoted wholly or in part to the same subject. Here let us take an opportunity for drawing attention to, and protesting against, a very common abuse of the term "edition" as applied to a technical book. Mr. Dugald Clerk describes the present volume as the "sixth edition" of his work; whereas, so far as he is concerned, it is only the second. What he or his publishers mean to imply by the use of the ordinal number "sixth" here must be that the original text has been reprinted five times before the author revised his matter. If this is so, then we submit, without the smallest respect for the custom of the trade in this regard, that a reprint is not a new edition. We do not know how many publishers honestly put upon the market reprints as such, without pretending that they are new editions; but the practice is far too general. It is unfair to authors as well as to the public. In the present instance, the author has done what he would probably have been only too glad to do before, if his publishers had given him the opportunity. He has brought the information supplied thoroughly up to date by the addition of two new parts—one dealing with modern gas-engines; the other describing the latest forms of oil-engines. It is with these additions that we shall concern ourselves; for the old matter, being chiefly theoretical and historical, remains as good as ever.

In what does the improvement of gas-engines during the past ten years consist? Mr. Clerk sums this up as follows: "A considerable advance has been made in the construction of large gas-engines. Gas-producers have been more extensively adopted; petroleum-engines have been produced which are practically useful although not quite so well understood as gas-engines; very effective and simple starting-gears have been invented and extensively applied; the slide-valve igniters have been practically abandoned, and the hot-tube igniters have taken their place; the compound principle has been advanced a stage; and generally the gas-engine has been made as reliable in its action as any steam-engine." From the commercial standpoint, the most important event of the ten years was the expiry of the Otto master-patent in 1890, which has had the effect of bringing down the price of Otto cycle engines by nearly one-half as compared with 1886 lists. While Mr. Clerk admits that this is a good result so far as it goes, as enabling many more people to make use of gas-engine power, it is not without its drawback to the development of this kind of engine as a motor. The wonderful unanimity with which British gas-engine makers have adopted the Otto cycle has led to the abandonment of the impulse-every-revolution engine. Mr. Clerk regrets this, because he is of opinion that engines of the latter type can alone be satisfactory for large motors. In this judgment we concur. The author particularly deplores the cessation of the labours of Mr. Atkinson in this connection. He criticizes most luminously the various attempts that have been made to construct gas-engines having an impulse every revolution; but he is compelled reluctantly to agree that commercially the Otto cycle engines hold the field.

Great advances have been made in the Otto cycle engine since 1886. In that year a 9-horse (nominal) gas-engine by Crossley consumed about 27 cubic feet of Manchester gas per brake horse power per hour; and now the consumption of a similar engine is as little as 17 cubic feet of gas per brake horse power. Engines of 40-horse power were the largest made in 1886; but now Otto engines are built as large as 400 indicated horse power. Mr. Clerk goes into details to show by what steps this advance has been made possible; giving all due credit to the Messrs. Crossley for their share in this progress.

* "The Gas and Oil Engine." By Dugald Clerk, Assoc.M.Inst.C.E., F.C.S., &c. Sixth edition, revised and enlarged. London: Longmans, Green, and Co.; 1896.

The merit of having built the largest gas-engine is accorded to Messrs. Andrew and Co., whose "Stockport" engine of 400-horse power is illustrated and described. The Barker form of Otto is also commended; and Messrs. Burt's engines are carefully studied. Indeed, all notable modern improvements in gas-engine design are thoroughly discussed by Mr. Clerk in the style of a master-artificer, the assumption of which by him is quite justified.

The author has a chapter devoted to the subject of the production of gas for motive power; and he criticizes very fairly the methods and merits of all familiar patterns of plant of this character. He gives the preference to the Dowson apparatus. It is one of the little ironies of text-book writing that, even since this volume has been in print, the practical application of the Mond producer to gas-engine working has introduced a new element into this question upon which the author has not been able to give an opinion. To this extent, therefore, the chapter in question is already old-fashioned. The chapter on the present position of gas-engine economy is a most valuable one, as indicating the lines upon which improvement of this type of motors may be expected to proceed. The part relating to oil-engines is very carefully and thoroughly written. The book has a valuable appendix consisting of a list of British gas and oil engine patents from 1791 to 1893 inclusive. We can recommend the volume as indispensable to those who want to know all there is to be known about gas and oil engines.

PERSONAL.

Mr. R. Rist has been elected a Director of the Brentford Gas Company, in place of his brother, the late Mr. Isaac Rist, whose death was noticed in a recent issue.

Mr. S. F. Andrews has been selected for the post of Secretary and Manager of the West Gloucestershire Water Company. The appointment was occasioned by the resignation of Mr. H. Marten, the General Manager of the Company, and by the engagements of Mr. James, the Secretary, disabling him from taking up his residence away from London. It is stated that Mr. Andrews has been holding an important public position in the district. The Company will not lose the services of Mr. Marten, as he has been elected to a vacancy on the Board, due to the resignation of Mr. Evan H. Llewellyn, M.P.

On Monday last week the officers and staff under Mr. W. R. Herring at the Huddersfield Corporation Gas-Works, presented him with an ormolu clock and ornaments, bearing the following inscription: "Presented to W. R. Herring, Esq., on the occasion of his leaving Huddersfield, as a token of esteem and regard from the Officers and Staff of the Huddersfield Corporation Gas Department." The presentation was made in the Committee-room, by Mr. J. Sykes, the Assistant-Manager, supported by Mr. J. North, the General Foreman, in presence of the subscribers. On Tuesday afternoon, Mr. Herring was presented with a pair of silver convertible table-lamps and candlesticks, and a silver match-box, by the chief officials of the Corporation. The presentation was made by the Town Clerk (Mr. F. C. Lloyd) supported by Mr. S. C. Potts, the Borough Accountant, and was suitably acknowledged by Mr. Herring.

The Summer Instructions of the Metropolitan Gas Referees, which were issued last Thursday, contain the usual notification that the maximum amount of sulphur permissible in gas will, until further notice, be 17 grains in 100 cubic feet. There is an addition to the section of the Instructions dealing with the testing for ammonia, specifying the conditions under which the portion of the liquid, set aside in case it should be desirable to repeat the volumetric testing, is to be used. Unless so used, it is to be preserved, in a bottle properly labelled, for a week. The name of the new Referee, Mr. C. Vernon Boys, who has replaced Professor Rücker, appears on the Instructions for the first time in conjunction with those of the other two Referees—Dr. Pole and Mr. A. G. Vernon Harcourt.

Chemical Society.—The anniversary meeting of this Society was held at Burlington House on the 31st ult., under the chairmanship of the retiring President, Mr. A. G. Vernon Harcourt, F.R.S., &c. The Society now numbers about 2080 fellows, of whom about 400 personally attended the meeting to record their votes for the election of officers for the ensuing year. Special interest attached to the meeting because of opposition—unprecedented in the annals of the Society—to the nominee of the Council for the Presidentship. They nominated Professor Dewar; but no fewer than 115 of the fellows nominated Professor Ramsay. During the preceding week, the fellows were freely canvassed by the supporters of each candidate; and the contest was expected to be a very close one. The actual number of votes recorded did not transpire; but the report of the Scrutineers declared Professor Dewar to have been elected. It is believed that many fellows opposed the Council's nominee from a desire to see certain reforms in the management of the Society carried into effect. About 150 fellows and their guests dined together at the Criterion Restaurant after the close of the meeting. Among the many distinguished scientists present were several whose names are well known in connection with the gas industry.

TECHNICAL RECORD.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

The Annual Meeting at Boston.

(*Concluded from p.* 714.)

A paper entitled "Separate Meters and Special Prices for Gas-Stove Consumption" was read by Colonel F. S. Richardson, of North Adams (Mass.). He commenced by pointing out that the policy to be pursued in selling artificial light must be influenced in every case by local conditions, as the same plan would not prove a success in every community; and he explained the circumstances which, in his particular case, rendered it advisable to make a marked difference between the price of gas sold for lighting and for other purposes. Four years ago, by dint of advertising and of cooking demonstrations, he succeeded in selling 25 gas cooking-stoves, and 15 in the following year; but it soon became apparent that the price of gas—7s. 9d. per 1000 cubic feet—was a great drawback to the popularity of the stoves. So in July, 1895, he introduced differential prices—7s. 4d. per 1000 cubic feet for lighting, and 5s. 10d. for other purposes by separate meters; and at the same time he offered to sell and fix stoves at cost price. The result was satisfactory; 62 stoves being sold that year, and 50 more last year. All of these were used regularly throughout the year, instead of in the summer only as before. The stove consumption for last year was over 2 million cubic feet; and the extra expenses, including meters, were very moderate as compared with the increased business. He was about to reduce the special price to 5s. per 1000 cubic feet, and push sales more vigorously, as he believed that liberality to the consumer was the best policy.

Mr. Nettleton said that for years he had advocated one all-round price as being the fair thing for all classes of consumers; but he now admitted having made a mistake, as it appeared that those who adopted differential rates not only sold more stoves, but more gas per stove than he could. He therefore intended to advise his Directors to make a special fuel price. Mr. Fowler said that, after trying separate meters and special terms for stove gas, he did not see the advantage of the plan. Mr. Leonard tried differential prices some years ago, when the price of gas was high; but the system was not wholly satisfactory. He preferred an all-round price, and sent a canvasser to visit every consumer once in three years, to attend to complaints, &c. He was selling gas now at 5s. 9d. per 1000 cubic feet, and could see no advantage in separate meters. Mr. Coffin agreed with the last speaker in working one all-round price, cut as low as possible, together with careful attention to the consumers, fitting stoves for use, &c.; and he thought the money spent in special meters could be laid out to better advantage in advertising and canvassing. Mr. Hassell said that, in his small Company, selling gas at 10s. per 1000 cubic feet, he offered a special price of 8s. 4d. This was started six years ago; and it had proved so satisfactory, that at present out of 600 consumers 200 had stoves. After the stoves were well established, he returned to a regular price by dropping to 7s. 6d. per 1000 cubic feet all round. Mr. Morrison had adopted a similar plan; and he believed that in a small undertaking, with a high price, it was a good policy. Mr. Sargent tried differential prices; but the users of large quantities of gas for lighting complained so much, that he found it advisable to go back to the all-round price. He had had fairly good luck in placing stoves; but one difficulty was that some of his neighbours sold gas cheaper than he could, and people said they would wait till he came down to the same price before buying ranges. Mr. Addicks had observed that the author of the paper sold more gas per consumer than any other small undertaking in Massachusetts. Some amusement was created by the statement that gas-stoves originally given away by the Boston Gas Company were to be found in other towns doing good service; the parties having moved and taken the stoves with them.

Colonel Richardson, in reply, admitted that large companies having a low all-round rate did not need differential prices. Gas at 5s. per 1000 cubic feet was quite as cheap as coal. But he still thought that, in any case, the differential price was the better policy; and he never had any difficulty with large lighting consumers. Most of the stove users were people of very moderate means. It was not so much the actual price at which gas was sold, as the way the customers were treated, that influenced business. Get them to believe that they were liberally treated, and the consumption would be sure to increase.

Mr. C. W. Hinman, of Boston, read a paper on the "Measurement of Gas." Whereas in dealing with liquids or solids, little differences of temperature or pressure need not be considered, with gases it was necessary to know these conditions exactly, and also whether other gases or vapours were present, before the volume could be arrived at. A pressure of 4 inches of water affected the volume to the extent of 1 per cent.; and so did a change of 5° in temperature. But gas in contact with water expanded 1 per cent. with about 3½° rise of temperature. When saturated with aqueous vapour, it contained 1 per cent. at 43°, 2 per cent. at 64°, 3 per cent. at 77°, 4 per cent. at 86°, and 5 per cent. at 93°. In accurate scientific measurements, it

was necessary to use mercury as the sealing liquid, and not water. The standard cubic foot measure was then described; and also meter-testing apparatus, and the methods of testing. The nominal rate alone was not a sufficient test; but meters should also be tested at a 1-light rate and at full capacity. Meters should be sound, capable of regular action for a long time, and work at a light pressure; and manufacturers now fairly covered these conditions. In dry meters, the valves should be accurately ground and set, and the diaphragms flexible yet gas-tight. The durability of the diaphragm depended upon the quality of the gas. Ammonia, oily vapour, or tar acted upon it or the oil with which it was treated; but a rather poor gas, free from impurity or vapours, appeared almost an ideal atmosphere for the preservation of leather. The nominal sizes of meters did not fairly indicate the quantity of gas they would pass. A so-called 3-light meter would supply 9 lights; and a 20-light meter, 30 lights, &c., according to the pressure. Thus, a 3-light would pass 34 cubic feet of water gas per hour, a 5-light meter 47 cubic feet, and a 10-light meter 70 cubic feet, with a loss of about 2-10ths pressure. But they would pass four times as much with a loss of 15-10ths pressure. They would pass about 20 per cent. more coal gas than water gas under the same conditions. But a meter should not be allowed to absorb over 4-10ths, because it always delivered gas at a fluctuating pressure; the variation being about one-third of the total pressure absorbed. So that directly the working pressure rose above about 4-10ths, these fluctuations became visible at the burners. They would not be so noticeable with heating burners; and therefore smaller meters at higher pressure might be used without inconvenience with cooking or heating stoves. If meters were set in a very warm place, the diaphragms became stiff; and if exposed to cold, they would soon be charged with condensed liquids.

The discussion consisted mostly of questions; and, in reply, the author said that he did not think overwork injured a meter beyond increasing the mechanical wear. After a long experience, he believed a meter should not remain in use more than five years without testing. The diaphragms lasted ten to fifteen years; and the cases, twice this time. Prepayment meters that were satisfactory and reliable were now on the market.

Mr. W. R. Addicks, of Boston, read a paper entitled "Reports on Gas Leaks: Their Management by a Large Gas Company." He divided the engineer's sphere of labour into three chief sections—viz., the manufacturing, the distribution, and the testing departments—of which he was now dealing with the second. This he further divided into four sub-sections—the main, the service, the meter, and the jobbing departments. He traced the course followed where a complaint of leakage was made verbally at the office. The complaint clerk enters all particulars obtainable from the messenger on a form kept in readiness, dates same with an automatic time stamp, sends the form by slide to the jobbing department, and if the case is serious also communicates direct by means of a speaking tube. Immediately on receipt, the necessary workmen are told off; the particulars on the form meanwhile being entered in a book kept for the purpose. The form is given to the jobber, who proceeds to the place and investigates; at once sending back for further help if necessary. If the leakage is found to be due to any defect in the main, the fact is notified to the department at once by means of a special form; and a foreman, with the necessary labourers, tools, &c., is promptly on the spot. Meanwhile the first arrivals are endeavouring to locate the leakage, and arranging for the proper ventilation of any rooms or buildings where the odour of gas is perceived. If the service-pipe is found to be at fault, this department is communicated with. Each department is provided with special forms for leaks, damage to person or property, accident, &c.; and when the defect is remedied, all details are entered on the original form, and it is returned to the office, together with the special reports. These are entered in the record book; and the form is handed to an inspector, who visits the locality next day and sees that all is right. After being initiated by him, it is finally filed. The meter department are notified by a similar process if necessary. If the trouble arises from the consumer's fittings, the jobber temporarily stops the leak, or cuts off the gas; at the same time serving a notice on the occupier, the counterpart of which is retained in the office. The inspector previously mentioned calls in these cases also, and notifies the fact of repairs being properly carried out, or otherwise, as the case may be. If he cannot report satisfactorily, further notices are issued to the consumer; and every possible endeavour is made to get the matter settled without falling back on the last resource of cutting off the gas in default. Communications received by letter or telephone are dealt with in a similar way; and very elaborate arrangements exist for securing prompt attention to complaints during the night. In addition to men on active night duty, the bedrooms of the principal officials are connected up by telephone with the offices. At night it is usual to break into premises, if necessary, in the presence of a police officer. In spite of all these arrangements, however, it is no unusual thing for the first notice of a serious accident to arrive in the form of a Press reporter looking after details. The precautions adopted for the prevention of leakage, as carried out by the test department, were next detailed. The valve system being in use all over the city, it is easy to isolate any particular section of main for testing, by means of a test meter in the usual way. All new mains and services are tested before being covered. When the system was first introduced, a small margin of leakage was allowed; but it was soon found to be possible to make the work absolutely gas-tight. There was also a staff appointed to inspect internal fittings according to rules issued by the Company, who would not fix the meter unless satisfied that the pipes were of proper dimensions, and sound under two tests—the first on the pipes only, and the second with all the fittings completed. Extensions were examined in a similar way; and the gas was stopped off if the results were unsatisfactory. The testing inspectors followed up all repairs to roads or other disturbances of the ground in the neighbourhood of the mains and services, the locality of conflagrations, &c. In remarking upon the various ills to which mains and services are exposed, the author mentioned that the sections of all his gas main-pipes were as heavy as those used for high-pressure water. It was found necessary to make periodical examinations of the service-pipes throughout the city; but the Company had no power to go beyond the meter, and difficulties arose on account of the negligence of consumers. All the main valves were systematically tested and turned periodically; and an officer of the Company attended all fires. In concluding, the author impressed the necessity for systematic, conscientious, and thoroughly supervized inspection, forms with printed questions for every answer required, and where possible the checking of the information from the report of a second independent inspector.

At the close of the paper, a large number of questions were put by members. In replying, Mr. Addicks said he used different thicknesses of pipe; but for very bad ground, he preferred wrought-iron to thick cast iron pipe. His mains were jointed up with two cement and one lead joint in every three lengths. The mains averaged 3 feet deep; and with regard to stopped services, he found great benefit by relaying in a larger size. The smallest size service he now laid was 1½ inches; and the reason for this was because it was the smallest pipe that could be obtained lap-welded. But, of course, he did not drill 1½-inch holes in 3-inch or 4-inch mains. He believed in the valve system; but he would not go so far as to say that in every district it should be adopted, because of the first expense. He would be guided by the leakage account. Some trouble had arisen in his experience from corrosion at the point where the services pass through the wall; and he was now considering the desirability of adopting thicker pipe at that point.

A paper on "Calorimetry" was read by Mr. C. D. Jenkins, the Massachusetts State Gas-Meter Inspector. After describing the Junkers calorimeter, and a test made with pure hydrogen by way of checking its accuracy, the author quoted some experiments with Newton gas of 17·2-candle power and 0·421 sp. gr., which gave a result of 662 British thermal units per cubic foot, after correcting to 60° and 30 inches. This was with dried gas, and included condensation of the whole of the water. Allowing for the water to escape as vapour, the result would be 600 British thermal units. A sample of 25-candle gas from Boston gave about 680 units. Some of the Charlestown 18-candle gas gave 615 units; a 25-candle gas from South Boston, 634 units; and a 17-candle Cambridge gas, 576 units. Analyses of some of the gases were also quoted. Confusion on this point had arisen by want of uniformity as to temperature and pressure—some correcting the gas to 60°, and some to 32°; and also as to drying the gas previously to the test, and including the heat given off by the condensation of the water to the liquid form. He advocated, as a proper standard, the use of 60° and 30 inches, gas saturated with moisture, and allowing the water of combustion to escape as vapour.

Mr. H. F. Coggeshall, of Fitchburg (Mass.), gave some interesting reminiscences of the introduction of gas in that town in 1853. The plant erected consisted of a retort-house 35 ft. by 24 ft.; two benches of threes, each 8 ft. by 12 in. by 20 in., which would burn off 150 to 200 lbs. of coal per charge; a flat box-washer 3 ft. by 3 ft. by 18 ft.; four purifiers each 6 ft. by 4 ft.; and a gas-holder 50 ft. by 16 ft. The first year he sold 1,612,000 cubic feet of gas at 16s. 8d. per 1000 feet, and lost about £23; but the next year he made a good profit, and had continued to do so since. At first one retort was found sufficient to supply his summer make. In 1862, he introduced clay retorts in place of iron. At the commencement he used Picton coal, yielding 2½ to 3 cubic feet per lb., with resin as an enricher; but in 1867, he adopted Glace Bay coal, which yielded more like 4½ cubic feet per lb. but cost 37s. 6d. per ton in the works, and gave trouble in the purifying house on account of the large proportion of sulphur it contained. This may have contributed to a serious case of spontaneous combustion in 1870, which led him to turn to Despard and Newburgh coal. By this time, he had got up to 5 or 6 millions per annum, and went in for beds of fives in place of threes, and an exhauster. Then he adopted Youghiogheny coal, and obtained a yield of 5 cubic feet per lb. The send-out of gas continued to increase; having reached 17 millions in 1890, when he erected new stacks of sixes with half-depth furnaces. Last year the output was 22 million cubic feet. Up to 1878, he used lime only for purifying; but he then adopted oxide. The cost of lime was £100 per annum at first; but it had gradually been brought down to less than £60. With oxide they changed a purifier once a month in summer and twice in winter; the average cost being £7 per annum.

This concluded the business; and the meeting was brought to a close with the usual votes of thanks.

THE DETECTION OF LEAKS IN GAS-MAINS.

The question of leakage, or "unaccounted-for gas," is one which is acknowledged to be of growing importance. Owing to the greatly extended use of gas, the net-work of mains is continually being increased both in length and diameter; while the soil beneath the public streets is traversed in every direction by sewers, water-pipes, and different kinds of electric cables. Moreover, on account of the more general employment of gas for cooking, heating, and motive power purposes, it has to be sent from the works at higher pressure, which has to be maintained throughout the day. Again, consumers demand reductions in price; so that as the annual amount of unaccounted-for gas tends to increase, the financial importance of the question is more keenly felt. Hence a simple, efficient, and economical plan which enables the relative extent of the leakage in each district to be rapidly determined at all seasons of the year will be of great value to gas companies and municipal authorities. It is proposed in the present article to describe a plan which, it is claimed, possesses all the above-named qualities, and to give a brief account of some of the results obtained by it.

To reduce the quantity of gas lost by leakage is to increase the productive capacity of the works, and to effect at the same time an annual saving. This will be of advantage to the supplying company in one or two ways: (1) If the cost of manufacture is reduced, the working capital is lowered in proportion. The weight of coal to be handled and screened, and of coke to be disposed of, will therefore also be decreased. The value of the gas saved, as a rule, repays in one year the first cost of the plant used for detecting the leaks. (2) The recovered gas is rendered available for sale. The economy realized in this case is on the mean selling price, for the quantity sold to the consumers is augmented by what is saved; and the sum thus received is clear profit. Supposing the total sale increases in two or three years by 5 per cent. In the case where the sale was originally 100, the cost of production being 50 per cent. of the receipts, the former becomes 105, and the clear profit 55 per cent.—an increase of 10 per cent. A further advantage resulting from a prompt and easy detection of the leakage of gas is the freedom from the risk of accidents, explosions, or fires due thereto. Fortunately, these are comparatively rare in England; but when they do occur they are extremely costly. The first object of a leak-detecting system, however, is to prevent waste of gas; and we give two cases where considerable saving has been effected as the result of the employment of the system which we wish to bring under the notice of our readers—viz., that of M. Bouvier, of Lyons, which was fully described and illustrated in the "JOURNAL" for Oct. 17, 1893 (p. 725). The figures were obtained from the managers of the respective works.

In the first case, the installation of about forty of M. Bouvier's syphon-isolators at a cost of £120, with an additional £216 for repairs to mains, resulted in an increase in the quantity of gas sold simultaneously with a diminution in the production; and the saving went on continuously after their installation. This is one of the strong points of the system. The first inspection reduced the leakage by 1,836,400 cubic feet, or one-third; while the quantity of gas sold increased by 565,200 cubic feet though 196 tons less coal were carbonized than in the previous year. The second inspection, at the end of the succeeding year, enabled a further saving of 854,800 cubic feet to be made, of which 462,400 cubic feet went towards augmenting the bulk of gas sold. The gas accounted for increased by 2120 cubic feet per ton; and the leakage per mile per year was reduced by 273,300 cubic feet. By a third inspection, in the following year, a further 384,800 cubic feet were saved—the leakage being finally brought down to 1,839,700 cubic feet, or a little more than one-third of the former amount (4,977,700 cubic feet). Then 229,500 cubic feet more was sold, and 155,300 cubic feet less produced; and the loss per mile of main per annum was brought down to 173,900 cubic feet. This caused an increase of profits, arising from two sources: An increased sale of gas to the extent of 229,500 cubic feet; and the saving resulting from having to produce 155,300 cubic feet less gas. Plainly, in this case, the increased returns are clear profit. The total gain in the three years amounted to 3,138,000 cubic feet a year on the former state of things. The result is that, supposing the quantity of gas sold to remain constant, there will be an annual economy to the above-named extent, which, with gas at 2s. 2d. per 1000 cubic feet, means a saving of about £339 per annum for a definite expenditure of £120 on plant, or a total outlay of (say) about £336, including the needful repair of defective mains. The receipts arising from the greater consumption of gas due to a larger number of burners being in use constitute a net saving; and 3,138,000 cubic feet more gas than formerly are available to meet the increase. In other words, until the consumption has augmented to the extent of 3,138,000 cubic feet, the dividends may be increased by the amount equal to the savings realized by stopping the leaks, without any further extension of the works.

We now turn to the second case, which refers to other works, the figures for which, in tons and cubic feet, are—

	Coal.	Gas Produced.	Gas Sold.	Gas Lost.
First year . . .	9442 ..	101,330,000 ..	80,880,000 ..	17,490,000
Second year . .	9084 ..	93,660,000 ..	78,460,000 ..	12,455,000
Decrease . . .	358 ..	7,670,000 ..	2,420,000 ..	5,035,000

The decrease in the quantity of gas sold during the year is mainly due to the adoption of the Welsbach burner; but it has been more than compensated for by the economy realized. After the first inspection, the saving was 174,400 cubic feet per mile. A further saving of 1,060,000 cubic feet was effected during the first half of the third year.

In order to discover gas leaks methodically, their extent must be measured in each actual section of the mains. Consequently an appliance for each section has to be employed. The measuring apparatus should be quite independent of the rest of the distributing plant. Therefore, in place of a meter, the use of which may be theoretically correct, but is impracticable in every-day work, there is substituted in M. Bouvier's system a portable gasholder, which is stronger and more accurate than a meter, and enables the mains to be tested under increased pressure from that already existing in them. The gasholder fills itself automatically with gas from the supply end of the isolated section; then, being loaded with weights, it forces this gas into the section under test at a regular pressure. The gasholder shows both the volume of the gas and the increase of pressure necessary for an exact and rapid test—advantages which a meter by itself does not possess. Measuring leaks by means of a gasholder is quicker, more accurate, and more sensitive than by any other method. Independent of the general distribution of gas, it gives at once a very clear idea of the state of each section, and shows by figures, from accurate observations recorded in a note-book day by day and street by street, the relative importance of the leaks therein.

As already mentioned, M. Bouvier's appliance has been described in our columns; but it may be useful to give again a few particulars in regard to it. The 1894 type of isolator is U-shaped, the two arms at the upper end branching off horizontally in opposite directions, and being connected directly to the mains with tulip or india-rubber ring joints. A cast-iron rib or partition between the two branches of the syphon serves to unite three small vertical tubes used for taking gas from the right and left side, and for pumping the water from the centre of the apparatus. The lower chamber, which is provided with an outlet at the bottom to facilitate casting, is made absolutely steam-tight. All corners are rounded off to prevent loss of pressure in the flow of gas; and finally the section is increased to compensate for changes in direction. The syphon, which is entirely of cast iron with the exception of the joint on the top, is fitted with iron tubes for the introduction of gas and water; and the cover-plate is bolted to the top flange. The body of the inspection chamber is circular, with a square top 11 in. by 11 in. The isolator is self-contained, and, being without any mechanical complications, does not entail any outlay for maintenance. Its first cost is small; and it is easily fitted in the mains, with which it then forms part. The seal is formed by water being poured down the central tube. The gasholder is supported by two gudgeons on a light angle-iron frame, with iron wheels and carriage springs. The receiver is annular, to diminish the weight. The inside cylinder carries, besides the two inlet and outlet gas-tubes (closed at the outer end by a rubber-seated valve), a blow-off cock. The gasholder is fitted with a scale graduated in cubic feet, a pressure-gauge, and counter-weights. The bell, which is about 3 feet high, is capable of holding 10½ cubic feet—a quantity sufficient to raise the pressure from 1 to 4 inches of water when connected to mains of a capacity of not less than 1450 cubic feet—*i.e.*, the capacity of a main 12 inches in diameter and 2000 feet long. In case the section under test exceeds this length, all that is necessary is to fill the bell more than once. The leakage is measured in cubic feet per minute under a 4-inch pressure by the rate of descent of the bell. The apparatus is strong, handy, and very light; the tank holding only 4½ cubic feet of water, which is poured in just before making a test.

The most suitable time in the day for testing is between four and six o'clock in the morning; and the method of testing is as follows: The cocks of the branches in the section to be tested must first be closed. The section under test is then isolated by filling up the syphons which connect it with the rest of the system. The gasholder is brought close to the spot, and the annular space surrounding the falling bell is filled up with water, the syphon inspection chamber opened, and the two outside tubes connected by rubber pipes to the two cocks on the gasholder. This is then put in connection with the "up-stream" side of the syphon; and the bell ascends—filling itself with gas. When it has reached the top of its run, the inlet-valve is shut off, and the bell full of gas is loaded with weights. The cock on the "down stream" side is then opened, and the bell begins to settle down—descending rapidly at first, and stopping when all the gas in the isolated section of the main is raised to a pressure of 4 inches. The bell then commences to descend farther, at a regular pace. Its velocity at this stage must be carefully noted, as it is these readings which measure the actual escapes. The results of the gasholder tests are entered in a special note-book kept for the purpose; the leaks in each district or section being located during the day by means of palladium tests, and repaired as soon as possible. Finally, another general test made with a portable gasholder one or two months afterwards shows exactly what saving has been effected in each district, and how the reduction of leakage is to be continued in the future. Thus a gas manager can in a few months, it is claimed for the arrangement, bring the leakage to a practically negligible quantity.

The other method of detecting leaks in gas-mains—viz., by

means of the palladium test is so well known that it is unnecessary to describe it; but certain precautions must be taken with its use—the test-paper being sensitive to sulphuretted hydrogen, which may be given off from the soil, as well as to the carbonic oxide present in tobacco smoke. Sunlight also exerts an influence upon the slips. Palladium tests should be conducted with extreme care; and only under these conditions are the indications at all reliable. However, when considered by themselves, these tests are wanting in accuracy, and therefore they cannot be relied upon as complete. The accuracy necessary to improve a network of mains, however, is ensured by measuring the leaks, district after district, under pressure, by means of the syphon isolator and the portable gasholder. The palladium test, though of little value by itself, forms a valuable check on the records when both systems are employed.

Summing up what has been stated above, we have only to say that it is claimed for M. Bouvier's system of detecting leakage that it is simple and easily carried out, that the first cost of the appliance is small, and that the expenses of maintenance are practically *nil*. As shown in the two examples given, the saving is at once apparent and considerable. These results are only two out of a number of similar cases, but they suffice, we think, to demonstrate conclusively the great reduction in leakage which it is possible to effect by the use of the system here described, and the consequent pecuniary advantage that ensues from its employment.

LUMINESCENCE.

In the course of his Royal Institution lecture on "Electric Shadows and Luminescence" Professor Silvanus P. Thompson observed that the latter term is due to Wiedemann, who used it to embrace all those cases in which light is produced, whether under the stimulus of electric discharge, of heat, of prior exposure to illumination, or of chemical action, and the like, in which the light is emitted at a lower temperature than that which would be necessary if it were to be emitted by means of incandescence. For the help of those who may be disposed to think that the "light of the future" may be found by this means, Professor Thompson has prepared the following table setting forth the different kinds of luminescence known to physical science :—

Phenomenon.	Substance in which it Occurs.
1.—Chemi-luminescence .	Phosphorus oxidizing in moist air; decaying wood; decaying fish; glowworm; firefly; marine organisms, &c.
2.—Photo-luminescence .	
(*a*) *Transient* = fluorescence.	Fluor-spar; uranium glass; quinine; scheelite; platino-cyanides of various bases; eosin, and many coal-tar products.
(*b*) *Persistent* = phosphorescence.	Bologna stone; Canton's phosphorus and other sulphides of alkaline earths; some diamonds, &c.
3.—Thermo-luminescence	Scheelite; fluor-spar.
4.—Tribo-luminescence .	Diamonds; sugar; uranyl nitrate; pentadacylparatolylketone.
5.—Electro-luminescence.	
(*a*) Effluvio-luminescence.	Many rarefied gases; many of the fluorescent and phosphorescent bodies.
(*b*) Kathodo-luminescence . .	Rubies, glass, diamonds, many gems and minerals.
6.—Crystallo-luminescence	Arsenious acid.
7.—Lyo-luminescence . .	Sub-chlorides of alkali-metals.
8.—X-luminescence . .	Platino-cyanides, scheelite, &c.

The names used to discriminate between the different sorts of luminescence require some brief explanation. Chemi-luminescence denotes that due to chemical action, as oxidation. Those bodies are said to be photo-luminescent which shine when they are shone upon. Then thermo-luminescence denotes the effect of heat. Tribo-luminescence is caused by rubbing certain bodies. There is also the kathodo-luminescence of objects placed in a Crookes tube; the crystal-luminescence of certain materials when solidifying; and the lyo-luminescence of others when they dissolve. Lastly, there is the X-luminescence set up by the X-rays. The most highly phosphorescent material yet produced, according to Professor Thompson, is an artificial preparation of sulphide of calcium manufactured by Mr. Horne, which has a candle power of about 0·1 of a standard candle per square inch, after exposure for a few seconds to direct sunlight. This brilliancy rapidly dies away; but a visible luminescence remains for many days.

A Champion of Acetylene.—Some curious statements with regard to acetylene are made by an anonymous writer in a recent number of the "Zeitschrift für Gas- und Wasserfach." He asserts that, at the instigation of interested persons who fear the competition of acetylene, the Press has published one-sided notices of it. Thus, with reference to its reputed toxic properties, eminent physiologists and investigators are said by the anonymous author to have now proved that acetylene is not poisonous. He further says that the terrifying reports of its explosive properties have been received as genuine by the general public. He asserts, however, that coal gas and water gas are not preferable to acetylene on this account; and that so long as gas is used, there will be explosions, but that acetylene is by no means more explosive than coal gas!

REGISTER OF PATENTS.

Actuating Gas and Water Cocks.—Ingram, A., of Wood Green, N. No. 3931; Feb. 21, 1896.

This invention of means for actuating gas and water cocks, consists of two trains of wheels, between two plates. One of the trains is an ordinary timepiece, with cylinder escapement, with a twenty-four hour motion work. The other train of wheels and pinions controls the tap, by means of the pinion of the first wheel of this control-train being fixed to the tap, so that it will open or close as the wheel revolves. On the dial of the clock are three or more indicators; and when these are set at any given time, they allow the control-train to be set in motion at the specified times, with the result that the gas is turned fully on, partially on, or put out, according to requirement.

Valves for Hot Gases.—Wheatley, W., of Liverpool, and Kros, G., of Scheveningen, Holland. No. 4979; March 5, 1896.

This invention relates to valves used in conduits for hot gases (especially when under high pressure); and it consists in the use of a suitable yielding or elastic seating in such valves, in combination with arrangements for cooling the seating.

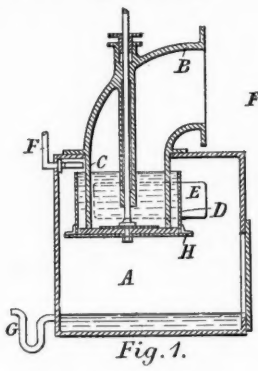


Fig. 1.

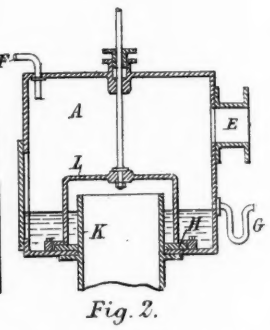


Fig. 2.

In fig. 1, the valve is shown to consist of a chamber A, in which a conduit B terminates in a dip-pipe C, whose annular rim forms a valve-face. A bucket D, larger in internal diameter than the rim, is mounted centrally to the dip-pipe C upon a spindle, provided with suitable means for lowering the bucket clear of the annular face of the dip-pipe, and raising it again until the valve-face comes in contact with the bottom of the bucket. The valve-chamber is provided with a second conduit E, a liquid supply-pipe F, and an overflow seal-pipe G. The pipe F is arranged so that the liquid shall drip into the bucket. In the bottom of the bucket is a yielding or elastic washer—preferably made of india-rubber, so as to form a soft seating or face for the valve. The central part of the washer is covered by a plate, which, with the washer, is secured to the bottom of the bucket—preferably by the end of the valve-spindle, as shown. The cooling liquid drops from the source of supply through the drip-pipe F into the bucket, and thereby prevents the deterioration of the elastic washer by the heat. The overflow from the bucket into the valve-chamber is carried away through the sealed overflow-pipe G.

Fig. 2 represents a valve of modified construction, in which an inverted bucket or bell L is used, and a stand-pipe K in place of the dip-pipe C. The washer H is here of annular form. It is seated round the stand-pipe K, and is held in position by a ring-plate or other suitable means. The liquid drips into the chamber A, which is provided with an overflow seal-pipe G.

One of the conduits D or E serves as the inlet to the valve, and the other for the outlet. Preferably, when the gases are of high temperature, the conduit leading directly into the bucket or bell is arranged for the inlet, as the flexible washer is somewhat protected by the plate and the cooling effect of the liquid round the bell, which is being constantly renewed from the supply-pipe F, to compensate for evaporation. Moreover, the time during which the valve is closed against the passage of the hot gases is generally not sufficient for the evaporation of the liquid enclosed within the bell.

Production of Carburetted Water Gas.—Wheatley, W., of Liverpool, and Kros, G., of Scheveningen, Holland. No. 4980; March 5, 1896.

This invention consists in improvements of the plant described in patent No. 15,469 of 1891.

Fig. 1 shows a side elevation and plan of the plant. Fig. 2 is a sectional elevation and plan of one of the generators. Fig. 3 is a sectional part elevation of the generator. Fig. 4 is a sectional elevation, longitudinal elevation, and plan of the carburetting retorts in position in the setting.

Two generators A are arranged conveniently for heating up the apparatus, and for the production of water gas; one being under blast for raising the fuel to incandescence, while the incandescent fuel in the other is decomposing steam and producing water gas. The producer gas from the generator under blast is led into a setting B, in which the carburetting and fixing retorts and steam superheater are set and secondary air-supply passages are arranged. The gas enters this setting at the base; passes round the carburetting retorts upwards; and enters a chamber in which a vertical cylindrical fixing retort is set—passing round this retort, and out at the flue. The oil-pipe leading from the oil-tank to the carburetting retort or retorts may also pass through the setting, so that the oil is heated previous to injection.

Each generator consists of a cylindrical shell of iron or steel having a lining of fire-brick, between which and the shell is a filling of sand. The roof of the generator externally is flat, and fitted with a central charging-door and seating with a suitable fastening. The roof internally is contracted to the charging-hole. The base of the generator is formed with a chamber, in which is disposed a water-trough having an inclined

side or bottom. The lining or internal wall of the generator converges towards this chamber. At a convenient distance above the bottom of the water-trough is arranged the fire-grate formed of fire-bars; and at each end of the grate is an opening through the generator wall—each opening being fitted with a fire-door and seating having a cross-bar and screw fastening. In the wall of the generator between the fire-doors is also formed a smaller opening similarly fitted with a door and fastening for the purpose of reaching the fuel. Into the chamber beneath the fire-bars is led the blast-pipe—this being preferably carried across the bars underneath and supported in the brickwork. The lower portion of the pipe beneath the bars is removed, so that the blast shall first be projected down upon the surface of the water in the trough. Secondary air-inlets (preferably three) are formed in the wall in the upper part of the generator, to which the blast from the air-main is conducted by pipes; suitable valves being arranged for the purpose of regulating the supply of air. A flue or conduit is arranged in the upper part of the generator for the exit of gases into the setting and retorts.

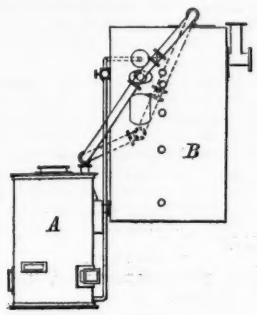
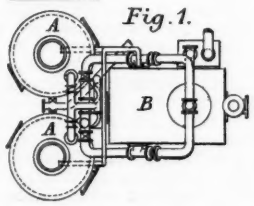


Fig. 1.



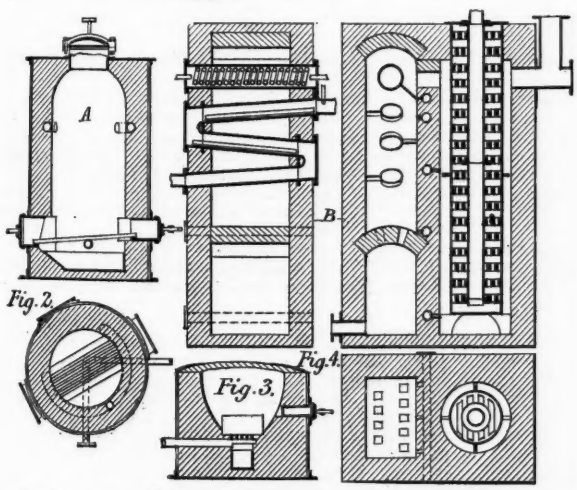


Fig. 2.

Fig. 3.

Fig. 4.

A valve-chamber is fitted to each generator at the exit or flue; and in this chamber is a valve which controls the conduit for the producer gases to the retort-setting. Leading out of the valve-chamber is a conduit for the water gas from the generator, which passes to the carburetting retorts —a cut-off valve being provided in the conduit, to prevent the passage of producer gas into the retorts when the generator is under blast.

The steam is led from the steam generator to the superheater, and thence (in such manner as to retain its heat) to the chamber under the grate preferably of the generator; the pipe terminating in a nozzle, and steam-cocks being provided to regulate the injection.

At the bottom part of the retort-setting nearest the generator is formed a combustion chamber, having preferably an arched roof provided with nostrils leading into a second chamber, in which the curburetting retorts are set, and also the steam superheater. The conduit for the producer gases from the generator leads into this combustion chamber. The carburetting retort (preferably of oval section) is set horizontally or slightly inclined from the horizontal. The oil is led into the carburetting retort at one part, so as to flow in the opposite direction to that of the water gas passing through. The condensed oil vapours collected during the carburation of the gas and any other heavier oil, may be introduced into the carburetting retort at the hottest part most convenient for the purpose. The steam superheater, which consists of coils of piping enclosed in a protective vessel, is disposed in the hottest convenient part of the setting —preferably in the second chamber above the carburetting retorts.

The producer gases pass out of this second chamber at the top, and are led into and through a flue formed in the setting, in which a vertical metal fixing retort is fitted in such a manner that the flue is arranged to pass down one side or over about one-half of the external surface of the metal retort, and underneath and up the other side in a similar manner before passing out of the setting into the chimney. In this flue are disposed a number of air-inlets for heated currents from the air-main, controlled by valves. The fixing-retort is preferably cylindrical inside, and has an inlet for the carburetted water gas at the top. There is fixed a central vertical metal conduit in the retort, which rests upon a grid, or is supported so that the gas may pass from the outside to the inside of the conduit; the top end of the conduit leading to the condensers and gasholder. The annular space between the central conduit and the casing of the retort is filled with checkerwork of brick, metal shavings, or other suitable material. The carburetted water gas from the carburetting retorts enters the fixing-retort at the top, passes through the checkerwork downwards, then upwards through the central conduit, and out of the retort into the condensers and holder.

Manufacture of Combustible Gas.—Kitson, A., of Philadelphia, U.S.A. No. 5291; March 9, 1896.

This invention relates to furnaces for generating gas from carbonaceous fuel subjected to treatment in generators of the type illustrated in patent No. 19,521 of 1893; and it has for its principal object the rendering of certain portions of the apparatus more automatic in action.

Production of Acetylene.—Holliday, T., of Huddersfield. No. 5873; March 16, 1896.

This acetylene gas apparatus consists of one or more generators and a displacement holder—the generators being placed on a level with or below the holder. The vessel which contains the carbide of calcium, or other carbide capable of giving off acetylene when treated with water, permits water to enter at a lower, and the gas to be withdrawn at a higher, level than the level of the carbide therein. The "displacement holder" is a gasholder in which the acetylene gas is allowed to displace water, which is thereby forced to a higher level, and can re-enter the holder as gas is withdrawn from it. It is arranged in such a manner that the gas formed in the generator passes direct to service-pipes, or through a cooler, and thence into service-pipes. If more gas is formed than is withdrawn from the service-pipes, the first effect is to force the water from the carbide through a passage from the lower level of the generator into the gas-containing part of the holder, at as high a level as practical. This ensures that before the water returns to the generator, the gas will have returned to it through the same passage on its way to the service-pipe; and after the water is forced from the carbide in this manner, any surplus gas enters the holder by the same passage, and lowers the level of the water therein. The passage for the water and gas serves also to allow water to re-enter the lower part of the generator, after the surplus gas is withdrawn through the generator and service-pipes.

Igniting Incandescent Gas-Burners.—Duke, J. F., of West Dulwich, S.E. No. 6585; March 25, 1896.

This invention has for its object to make incandescent gas-lamps self-lighting—that is to say, so that they shall become ignited by the action of the gas itself when turned on.

For this purpose, the patentee proposes to apply platinum black, or metallic platinum in a finely-divided state, or a salt of platinum, preferably to the upper part of the mantle; and to fit to the mantle an automatic gas-igniter of the kind described in patent No. 969 of 1895. This consists of a block of meerschaum or other porous material containing platinum black in its pores; the block being placed in contact, either by itself or in conjunction with one or more platinum wires, with the part of the mantle to which the platinum black has been applied. The action is that, when the gas is turned on and plays upon the porous block containing platinum black in its pores, the block is raised to a red heat, and the heat is transmitted to the part of the mantle to which the platinum black has been applied, with the result that sufficient heat is generated to ignite the gas.

The attachment of the platinum black to the mantle is effected by coating part of it with a solution of bi-chloride of platinum, and then reducing this to the state of platinum black by any well-known method. The solution is preferably applied in a streak or line running downwards from the upper part of the mantle. The porous block may be attached to the usual fringe or hem at the top of the mantle, or it may be strung on to the asbestos thread used to fasten the mantle.

Generating and Storing Acetylene.—Bayley, J. C., of Bournemouth. No. 6739; March 27, 1896.

Referring to his invention (the apparatus being especially suitable for use in domestic installations), the patentee points out that acetylene gas has a strong affinity for water; and it is necessary to prevent waste of gas by absorption, in order to obtain the most satisfactory results. In all acetylene gas apparatus as at present constructed, the gas is stored in contact with water; the action of the apparatus (which is as a rule automatic) being due to the increasing pressure of the gas produced acting on the water, and forcing it out of the generator and storage vessel into a tank. In his apparatus, the gas does not come at all into contact with the water; and therefore loss due to absorption is avoided. A further object is to regulate the head of water, and keep it constant, so that the pressure at the point of ignition shall be uniform.

In carrying out the invention, the gas passes as produced into a closed expansible and collapsible chamber, contained in the storage cylinder or vessel; and the cistern into which the water is forced is mounted so that it can be raised and lowered as the water in it decreases or increases, and thus the head of water is kept constant. In some cases, the storage cylinder is provided with a plain slab, which floats on the top of the water, and, extending over practically the whole surface of the water, largely prevents the gas coming into contact with it. The generator is provided with a double valve, operated by a single handle, so as to admit and shut off water to and from, and empty, the generator, and provide for the passage of the gas produced as and when required.

Scurfing Gas-Retorts—Billington, C., of Stoke-on-Trent. No. 7286 April 4, 1896.

The patentee proposes the application of a forced draught, provided by a Roots blower or other suitable centrifugal fan, in order to detach or loosen the scurf in gas-retorts, so that it may be readily removed. This result is said to be obtained through the large volume of cold air thus

introduced into the hot retort acting on the sheet of carbon, and cracking it up, so that it can be raked out without interfering with the action of the retort.

Retort-Lid Fastenings.—Box, W. W., of New Brompton. No. 10,359; May 14, 1896.

This fastening for retort-lids consists of a cross-bar, to which the lid is attached, and which at one end is hinged to the mouthpiece. At its other end, it is adapted to be fixed thereto by means of a weighted catch; the cross-bar being provided with a device for pressing the lid against its seat or face, to make a tight joint.

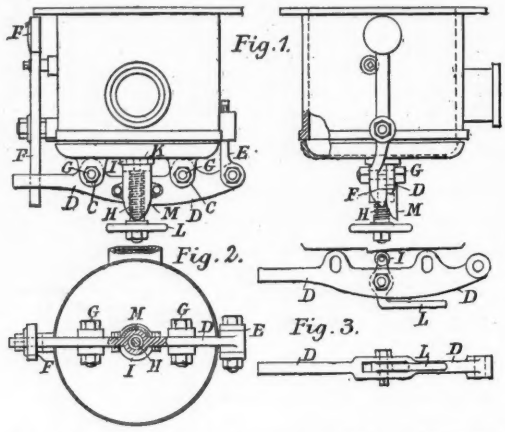


Fig. 1 is a plan and side view of a retort mouthpiece, with the fastening applied. Fig. 2 is a part sectional front view.

The mouthpiece-lid is provided with one or more (here two) sets of lugs C; and in between these, there is a cross-bar D, pivoted at one end to a lug E, attached to (or made in one with) the mouthpiece in such manner that the lid is supported by, and swings with, the cross-bar, while the other end of the latter is constructed to hook over a catch F, pivoted to the opposite side of the mouthpiece and weighted. In order to prevent the lid from being displaced on the cross-bar, the latter is provided with oval holes; and there are pins or bolts G, which pass through the lugs on the lid and through the oval holes in such manner that, while the lid is kept in position, it is allowed a small amount of play on the cross-bar.

In order to make a tight joint between the lid and the face of the mouthpiece, the cross-bar is provided with a screwed hole in the middle, and a screwed spindle H passes through it. The end of the spindle nearest the lid is reduced in diameter; and there is mounted thereon a ferrule or boss I, which bears against the lid. The ferrule is prevented from falling off by a nut K or other fastener (such as a key or set-screw) taking into an annular groove near the inner end of the spindle H. This spindle is preferably operated by a hand-wheel L, without spokes—as, in practice, says the patentee, it is found that the operators take advantage of anything whereby they may obtain increased leverage, with the frequent result that the fastenings are strained, and sometimes broken. To prevent the tar and pitch from getting to, and clogging up, the screwed spindle, the cross-bar is provided with a shield M to cover the screw.

Fig. 3 is a plan view and side view of a cross-bar provided with another form of device for pressing the lid against the retort-mouth. L is a hand-lever pivoted to the cross-bar, and carrying a roller I, which, in the position shown, bears hard on the lid, and presses it against the retort-mouth so as to make a tight joint. The lid is at this place slightly sloping or cam shaped. Or the lever may be made with a cam-shaped end, without being fitted with a roller.

Automatically Generating and Distributing Acetylene.—Tobler, A., of Garenne-Colombes, France. No. 12,662; June 9, 1896.

The objects of this invention are: (1) To cause water under constant pressure to be passed through a series of generators containing calcium carbide, in such manner as to bring the generators successively into action; (2) to regulate the pressure of the gas generated; and (3) to effect its distribution to the burners at any distance from the apparatus.

The apparatus comprises a reservoir to supply the water necessary for the generation of the acetylene gas, as well as an excess which "by absorbing the caloric developed in the generators, prevents the temperature rising therein." The water in the reservoir is under the pressure of a piston whose rod has a tray loaded with weights for regulating the pressure in the apparatus. The piston rod is graduated to correspond to the liquid capacities of the generators, so as to indicate the number of generators exhausted and the level of the water in the generator in action; and it is guided by rollers and guides. The reservoir is in communication with the lower part of the first of a series of generators, the top of the first of which is connected with the lower part of the next by flexible tubes, so as to permit of the generators being installed or removed while the apparatus is at work; each tube being provided at top and bottom with ball-valves, which permit of the entrance of water to the generators, but prevent its return therefrom. Each of the generators contains an inner container of wire gauze, closed at the bottom, and containing calcium carbide. The outer cylinder is tightly closed at the top by a cover secured by a bayonet-joint, and connected, by a flexible tube and nozzle (provided with a stopcock), with a collecting-main for conducting the gas generated into the bell of a holder, whence it is delivered for consumption. The bell of the holder is continued upwards above its crown in the form of a cylinder, so that the pressure of the gas stored in the bell will depress the level of the liquid within the bell, and cause it to rise between the cylinders. Upon water being forced into the first generator, acetylene is generated and conducted to the holder; and when the carbide contained in the first generator is exhausted, so that no more gas is produced, the water fills this generator and overflows into the next generator, where the action is repeated, and so on.

Generating Acetylene.—Quelle, E., of Paris. No. 29,500; Dec. 22, 1896.

This invention, relating to apparatus for generating acetylene gas, has for its object: (1) To lessen the time of contact between the water and the calcium or other metallic carbide. (2) To prevent the presence or back-flow of air into the apparatus. (3) To maintain (when a gasholder is used) free communication between the holder and the generator or generators, but at the same time to allow the decomposition of the carbide to be stopped at any time. (4) To divide up the mass of carbide, in order to prevent too violent a reaction.

Incandescent Mantles.—Rammoser, A., and Hake, A. von, of Berlin. No. 29,613; Dec. 23, 1896.

The claim for this invention is for "a solid body for incandescent lighting, consisting of an appropriate plait or fabric composed of solid incandescent wires to, or under, one another; the latter being produced by covering or overspinning one or several thin wires of the group of the platinum metals with an appropriate vegetable silk, or any other usable fibres, in one or more layers. These thin wires and fibres are twisted together, plaited, spun, or woven with one another, or connected appropriately together in any other manner; the said fibres being previously or afterwards impregnated with a lighting fluid." The incandescent body referred to is composed of: (*a*) Wires of pure platinum, iridium, osmium, ruthenium, rhodium, or palladium; (*b*) wires consisting of any appropriate alloy of the metals mentioned under (*a*) with one another or with other metals. The material, after having been cleaned, is impregnated with one of the known lighting fluids, and then made up into suitable shapes. The great advantage of this invention, in comparison with other bodies composed of cotton threads or the like, is said to be that the body is resistant, and at the same time elastic, which qualities protect it "against injuries by shocks, falls, or the like, and secure for it an unlimited durability."

Generating Acetylene Gas.—Schumacher, J., of Chicago, U.S.A. No. 30,134; Dec. 31, 1896.

This apparatus for generating gas from metallic carbide and water, and for arresting the generation when desired, consists of a combination of (1) a generating chamber adapted to contain the carbide, and having an inlet for water; (2) means for introducing into the chamber, through the inlet, during the period of generation, a regulated quantity of water; (3) means for confining the residue, where it forms, between the water-inlet and the body of carbide, whereby it is made to serve as a medium through which the water is fed to the carbide, and whereby (in order to arrest the generation of gas) the dry carbide may be allowed to fall away from the residue and leave the latter undisturbed where it is formed; and (4) means for keeping the water and carbide apart when the carbide and residue are thus separated.

Gas Cooking and Heating Stoves.—Schultz, F., of Lippe, Germany. No. 120; Jan. 2, 1897.

In the gas-stove of this invention, the outer casing is isolated by means of a current of air, which is at the same time preliminarily heated for combustion purposes; and the energy of the draught of air towards the burners or flames is thereby increased. For this purpose also special chambers of peculiar form are arranged around the burners.

The patentee claims as his invention a gas cooking and heating stove in which the burners are arranged in combustion chambers underneath the top plate, and within apertures in the bottom of the combustion chambers, and of a form corresponding to the burners, and with or without a rim or edge rising up from the combustion chambers. Also an arrangement of air-passages wholly or partially surrounding the combustion chambers.

Forming and Burning Acetylene Gas.—Zimmerman, J., of Chicago, U.S.A. No. 328; Jan. 5, 1897.

This process for forming acetylene gas consists in normally holding the liquid and gas-producing material separate from each other, and then automatically admitting the water into contact with the material as desired to form the gas. The apparatus employed for this purpose consists of a combination of (1) a receptacle provided with a liquid-holding chamber and gas-producing chamber and gas-retaining chamber; (2) means for automatically admitting the liquid into the gas-producing chamber in desired quantities; (3) a pipe connected with the gas-producing chamber and the gas-retaining chamber; (4) an automatic pressure-regulator on such pipe, and located in the retaining chamber—comprising a perforated casing, a diaphragm to be actuated by the pressure in the retaining chamber, a valve-seat connected with the pipe that leads from the gas-producing chamber, a valve connected with the diaphragm to be operated thereby, so as to close the perforation of the valve seat when the pressure reaches a predetermined point, and open it when it falls below such a point; and (5) mechanism for regulating the tension of the diaphragm to the desired point.

Atmospheric Gas-Burners.—Symons, P., of Swansea. No. 491; Jan. 7, 1897.

This atmospheric gas-burner is provided with means whereby the quantity of air, admitted to the burner is regulated by the operation of the gas tap or cock, which is near the mixing chamber, into which the gas supply is led in the ordinary way, and in the sides or ends of which air-inlet ports are provided. On the spindle of the tap, or on the exterior or interior of the mixing chamber (so as to be operated from the spindle by suitable mechanism), is a rotating plate or segment forming a shutter, and operating as a valve to open or close the air-inlet ports as, and when, the tap or cock is opened or closed. In this way, the air supply to the mixing chamber is regulated so as to correspond with the quantity of gas passing through the tap—thus minimizing the danger of the "lighting back" of the burner.

Carburetting Apparatus.—Gautier, C., and Wehrle, X., of Paris. No. 746; Jan. 11, 1897.

The patentees point out that carburetting appliances are divided into two categories: (1) Those into which the air is forced by fans or the like;

and (2) those into which the air is drawn by suction. Apparatus of the first type—supplied by a pump or the like—requires special mechanism, the operation of which is dependent upon the action of a motor; the motor being on its part likewise dependent on the action of the carburetting apparatus. The consequence is that the starting operation, effected by hand, proves often lengthy and difficult. Carburetting appliances operated by suction are also of various kinds—namely, those in which the carburation is effected by atomizing the liquid (gasoline, petroleum essence, or oil), and others in which the carburation is effected by the contact of the air with the liquid in motion. Apparatus of the former kind is less complicated, and consequently preferable to that of the latter kind.

In the apparatus which forms the subject of this invention, the air is drawn in by suction; and the carburation is effected by atomizing the carburetting liquid. The claim advanced by the patentees being for "an improved carburetting apparatus in communication with an air-inlet and an admission-inlet for the carburetting liquid; the latter inlet being alternately closed by a valve, provided with an opposing spring, and opened by the suction resulting from the receding movement of the piston or pistons during the action of the motor—the air thus drawn in atomizing the carburetting liquid." The supply of air, admitted to the mixing chamber is regulated by a device adapted to more or less block the holes provided in the cover or the like.

APPLICATIONS FOR LETTERS PATENT.

6775.—Moeller, J., "Bunsen burners for incandescent gas lighting." March 15.
6779.—Boulaine, M. A. A. E., "Production of acetylene." March 15.
6797.—Ehrenwerth, A., "Manufacture of incandescent light." March 15.
6883.—Matyr, E. B. de la, "Gas-meters." March 16.
6940.—Kent, H. A., "Inverted incandescent gas-lights, and the attachment of incandescent material to same." March 17.
6942.—Parkinson, W. C., "Gas-fires." March 17.
6997.—Pereire, G., Sorel, E., and Cruvellier, B., "Manufacture of acetylene gas." March 17.
7010.—Moeller, J., "Bunsen burners for incandescent gas lighting." March 17.
7011.—Gunning, J., "Extinguishing lights at a predetermined time." March 17.
7013.—Merrifield, L. L., "Manufacture of carburetted water gas." March 17.
7043.—Lyons, T. & J., and Pearson, J., "Acetylene gas generators." March 18.
7067.—Fletcher, T., and Fletcher, Russell, and Co., Limited, "Gas-furnaces." March 18.
7071.—Ingraham, C. W., and M'Swords, P. B., "Carburetters." March 18.
7098.—Reeve, S. A., "Gas-engines." March 18.
7109.—Thompson, W. P., "Suspended lamp for incandescent gas lighting." A communication from H. Arnold. March 18.
7151.—Salmon, C., and Masson, P. W., "Water installations for domestic or manufacturing purposes." March 19.
7161.—Crossley, W. J, and Atkinson, J., "Internal combustion motors." March 19.
7162.—Crossley, W. J., and Dunlop, J., "Internal combustion motors." March 19.
7168.—Thorn, F. S., and Hoddle, C., "Acetylene gas generators." March 19.
7243.—Simmance, J. F., "Coin-freed fluid meters." March 19.
7294.—Guilbaud, A., "Water-meter." March 20.
7295.—Caron, P. L., "Producing acetylene gas." March 20.
7296.—Guérard, P., "Production of acetylene gas." March 20.
7313.—Schweizer, J., and Müller, J. R., "Incandescent gas-light burners." March 20.
7330.—Schoder, R., "Stiffening incandescent mantles." March 20.
7342.—Fusshöller, F., "Appliance for the quick and proper adjustment of the blue-flame in gas-light incandescent burners." March 20.
7435.—Billington, C., jun., "Removing scurf from gas-retorts." March 23.
7450.—Bickerton, H. N., and Bradley, H. W., "Silencing the air and gas suction in engines and pumps." March 23.
7514.—Thompson, W. P., "Chimney or globe for incandescent gas lighting." A communication from H. Arnhold. March 23.
7523.—Lenze, P., "Automatically lighting and extinguishing gas-burners." March 23.
7651.—Arter, A., "Treatment of gas for illuminating and other purposes." March 24.
7686.—Billington, C., jun., "Removing or loosening scurf from the interior surface of gas-retorts." March 25.
7744.—Brewer, E. G., "Generating acetylene gas." A communication from the Gesellschaft für Acetylen-Gaslicht Basel. March 25.
7782.—Lake, H. H., "Generating acetylene gas." A communication from F. Ferracciu. March 25.
7785.—Bánki, D., and Csonka, J., "Igniting apparatus for gas-motors." March 25.
7858.—Higgins, E. S., Bessemer, H. A., and Nicholson, W. B., "Production of gas and its utilization for the generation of steam and for other purposes." March 26.
7900.—Binns, J. P. & H. G., "Gas and oil engines." March 27.
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7918.—Kitchen, J. G. A., "Acetylene generators." March 27.
7920.—Léry, J. B. de, "Apparatus for effecting illumination partly by flame and partly by incandescence." March 27.
7921.—Léry, J. B. de, "Burners for incandescent gas lighting." March 27.
7927.—Meikle, J., "Gas-motors." March 27.
7929.—Smith, F. H., "Acetylene gas lamp or generator." March 27.
7978.—Elton, Sir E. H., and Stephens, R., "Effecting the supply and ignition of gas at various places from gas-works or other stations, applicable also to controlling the supply of other fluids." March 27.
7982.—Braunerhjelm, C. A. G., "Electrically operated gas-burners," March 27.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Gas and Water Testing by the London County Council.

Sir,—In July last, some correspondence appeared in the "Journal," between the Chairman of the South Metropolitan Gas Company, the Chemist to the London County Council, and myself, with reference to the difference in value of the illuminating power of London gas as reported from the official testing-rooms and that said to have been found by the travelling photometer at Board schools, Fire Brigade stations, and other places, amounting in some cases to 2 or 3 candles. Reasons were then given for these apparent discrepancies; and it was also pointed out that the whole of the circumstances were well known and taken into consideration when the Act was passed that regulates the testing. That the Gas Referees had all the facts in their minds when they arranged the position of the present testing-stations, there cannot be a doubt. I therefore fail to see any valid reason for attempting to disturb this arrangement, especially when the fact is taken into consideration that, one way and another, it has cost the public nearly half a million of money.

I should not have troubled you again, only I see in the public Press that the officials of the County Council are again actively engaged in spending the public money in making these useless tests with the travelling photometer. The East-end of London generally, and Whitechapel in particular, is the locality favoured this time; and, so far as I can learn, the object is to obtain further evidence in support of the famous report made by Mr. Dibdin to the Council with a view to substituting the travelling photometer for the present testing-stations.

The tests made at Whitechapel confirm those previously made in the North and South. It is quite time that this matter was set at rest. The present testing-stations, in my opinion, fairly represent the quality of the bulk of the gas leaving the various works, and thus are a sufficient protection to the public; and that this was what the Act of Parliament intended, is made clear by the evidence given by Mr. Vernon Harcourt in the recent Dublin case, which was to the effect "that the London Companies should supply gas of 16 candles, as tested in the manner prescribed by Parliament." In these circumstances, I fail to see any reason for making these expensive tests with the travelling photometer, except it be that the Chemical Department wishes to justify its existence; and that it needs justifying is certain.

It may be well to hark back a little. A short time before the present Chemist entered upon his duties in 1884, the Department consisted of one Chemist (the late Mr. T. W. Keates), at a salary of £270 a year, which included allowance for an Assistant, one small laboratory, and about seven Gas Examiners. Those who knew the late Chemist will remember the sound work he did, and that he needs no eulogy from me. The Department now comprises three large laboratories, and twenty gas-testing stations employing upwards of a hundred persons, with salaries varying from £100 to £800 a year; the total cost to the public being something enormous. This is a "Progressive policy" with a vengeance.

I am acquainted with many municipal laboratories where all kinds of analytical work are continuously carried on; but they fall into utter insignificance when compared with this gigantic affair. Further, when it is considered that the Government Laboratory at Somerset House employs only about a dozen people, one still more wonders why such a large staff is wanted at Spring Gardens. It may be, as stated, that the Chemist to the Council has "saved the ratepayers millions of pounds" in connection with "deodorization," "bacterial filtration," and the discovery, I presume, of "wet mud" in water. Let us hope it is so.

The time has now, I think, come when the analysis of water and gas should be allowed to rest. Too much money has been spent on it, with but little benefit to the public; and they should be taught to look with suspicion upon the continued expansion of the Chemical Department of the London County Council, which has only served to swell the rates, and unnecessarily harass the Gas and Water Companies, and is out of all proportion to the amount of work done and the needs of the public.

342, *Strand, W.C.*,
April 2, 1897.

Vincent Taylor, F.C.S.,
Formerly of the L.C.C. Chemical Department.

The Wages of Brighouse Gas Stokers.—The stokers at the Brighouse Corporation Gas-Works, lately made application to the Gas Committee for an increase of pay for Sunday labour. This the Committee have declined to accede; but they have resolved to increase their wages by 3d. per shift.

The Hull Corporation and the Kingston-upon-Hull Gas-Works.—The Gas Committee of the Hull Town Council have approved of a draft agreement between the Kingston-upon-Hull Gas Company and the Corporation for the purchase of the works of the former. The price is fixed at £90,000, with £2500 compensation; the date for the completion of the transaction being March 31 next year. In the meantime, the Company are to maintain the works in a proper state of repair.

New Water-Works for Fulwood.—In the "Journal" for Feb. 25 last year, some information was given as to the new water-works which the Fulwood District Council were constructing. According to the minutes presented at the last meeting of that body, a sum of £5636 is required beyond the original estimate in order to complete the works. Of this amount, the Engineer (Mr. Myers) states that £3829 is for expenditure which he could not possibly be expected to foresee. It was decided to apply for additional borrowing powers to the extent of £7000, of which £1000 is to be spent in laying new mains.

Water-Works for North Ferriby.—An inquiry has been held in regard to an application by the Sculcoates Rural District Council for the sanction of the Local Government Board to the borrowing of £2700 for the purpose of constructing water-works for North Ferriby. The proposed works comprise the construction of a well 204 feet deep and 6 feet in diameter, a set of three-throw pumps, an engine-house, an 8-horse power gas or oil engine, and a reservoir to hold 27,000 gallons. The estimated cost of the work is £2400. Nearly one-fifth of the first outlay will be borne by Messrs. Turner, upon whose land the works are to be constructed.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Chichester Corporation Water Bill, Edinburgh Corporation Bill, Leeds Corporation Bill, Weymouth Gas Bill.

Bills read a second time and committed: Dumfries and Maxwelltown Water Bill, Huddersfield Corporation Bill.

Bills reported, with amendments: Newhaven and Seaford Water Bill, Torquay Corporation Water Bill.

Bill rejected: Rhymney and Aber Valleys Gas and Water Bill.

Bills read the third time and passed: Cowes Gas Bill, Crays Gas Bill, Loughborough Corporation Bill, Lowestoft Water and Gas Bill, Malvern Link Urban District Gas Bill, South Metropolitan Gas Bill, Tynemouth Gas Bill.

HOUSE OF COMMONS.

Tuesday, March 30.

LONDON WATER COMMISSION.

Mr. W. F. D. Smith asked the President of the Local Government Board whether he could state the terms of reference to the Royal Commission on the London Water Companies.

Mr. Chaplin: The terms of the reference are as follows: (1) To inquire and report whether, having regard to financial considerations and to present and prospective requirements as regards water supply in the districts within the limits of supply of the Metropolitan Water Companies, it is desirable, in the interests of the ratepayers and water consumers in those districts, that the undertakings of the Water Companies should be acquired and managed either (*a*) by one authority, or (*b*) by several authorities; and, if so, what should be such authority or authorities. To what extent physical severance of the works and other property and sources of supply of the several Companies, and the division thereof between different local authorities within the limits of supply, are practicable and desirable; and what are the legal powers necessary to give effect to any such arrangements. (2) If the undertakings are not so acquired, whether additional powers of control should be exercised by local or other authorities; and, if so, what those powers should be. (3) Whether it is practicable to connect any two or more of the different systems of supply now administered by the eight Metropolitan Companies; and, if so, by whom and in what proportions should the cost of connecting them be borne, and what are the legal powers necessary to give effect to any such arrangement.

Mr. Marks asked when the Metropolitan Water Consumers' Bill would be introduced.

Mr. Chaplin: That Bill will be introduced, I hope, as soon as I see a reasonable prospect of proceeding with it; but I do not think there is any chance of my seeing that prospect before Easter.

Thursday, April 1.

WATER GAS.

Mr. T. M. Healy asked the Secretary of State for the Home Department whether he was aware that the large English Gas Companies were making large quantities of water gas, and turning it into the mains with coal gas, so that some cases of gas poisoning had already occurred; and whether any means would be taken to protect the public against the admixture of "this most poisonous substance" with coal gas.

Mr. Ritchie: I am not aware that any cases of gas poisoning have occurred in consequence of the practice to which the hon. gentleman refers. If the hon. member will supply me with particulars as to any such cases, I will cause inquiry to be made.

The following further progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Harrogate Corporation (Water Transfer) Bill, Lowestoft Water and Gas Bill, Loughborough Corporation Bill, Malvern Link Urban District Gas Bill, Newport Corporation Bill.

Bills reported: Devonport Water Bill, Luton Water Bill, Pwllheli Corporation Bill.

Bills read the third time and passed: Ashford Urban District Gas Bill, Chichester Corporation Water Bill, Crowborough District Water Bill, Dublin Corporation Bill, Edinburgh Corporation Bill, Leeds Corporation Bill, Weymouth Gas Bill.

The Standing Orders Committee reported on Friday that the Standing Orders ought to be dispensed with in the case of the petition for the Southwark and Vauxhall Water Bill, and that the parties should be permitted to proceed. This was agreed to by the House; and the Bill was ordered to be brought in by Mr. Aird and Mr. Murdoch.

A petition from the Cirencester Urban District Council for leave to present a petition for a Water Bill was duly referred to the Standing Orders Committee, who have reported that the parties should be permitted to proceed.

HOUSE OF LORDS COMMITTEE.

Friday, March 19.

(*Before Lord* Knutsford, *Chairman, the Marquis of* Granby, *the Earl of* Stamford, *Lord* Wenlock, *and Lord* Clifden.)

CAERPHILLY URBAN DISTRICT COUNCIL BILL.

This is a Bill to enable the Urban District Council of Caerphilly to carry out additional work; to obtain more water for the supply of their district; and incidentally to acquire that part of the works of the Rhymney Valley Gas and Water Company who supply a small part of the Caerphilly district, together with the undertakings of two small non-statutory Companies—namely, the Caerphilly and the Taff's Well Gaslight, Coke, and Water-Works Companies.

Mr. Freeman, Q.C., Mr. Lewis Coward, and Mr. Moon appeared for the Caerphilly District Council. The various opponents were represented as follows: Harry St. Aubyn Goodrich and others, by Mr. Claude Baggallay; for the Rhymney Valley Gas and Water Company and the promoters of the Rhymney and Aber Valleys Gas and Water Bill, Mr. Balfour Browne, Q.C., Mr. Claude Baggallay, Mr. Joseph Shaw, and Mr. Trevor Lewis; Lord Windsor, by Mr. Pember, Q.C., and Mr. Rhys Williams; the Windsor Steam Coal Company, by Mr. Joseph Shaw; and Mrs. Ellen Thomas, the Trustees of the will of Edward Llewellyn Thomas, and Miss Clara Thomas, by Mr. Rhys Williams.

Mr. Freeman, in opening the case for the promoters, said that the reason and justification of the Bill promoted by his clients was that their district had now absolutely reached starvation point in respect of water, which there was no sufficient means of supplying at the present time; that there were good and sufficient means if the Bill were passed; and that on the medical and other evidence that would be forthcoming, it would be shown conclusively that the Council would be failing in their duty if they did not ask for the powers sought by the Bill. The object of the Rhymney and Aber Valleys Bill—a very large scheme, which competed to some extent with that of the Caerphilly District Board—was to construct gas and water-works; to acquire the undertaking of the existing Gas and Water Company; and to purchase compulsorily the Rhymney Iron Company, the Rhymney Gas Company, the Caerphilly Gas and Water Company, and the Tredegar Gas and Water Company, and to supply with water a certain portion of the district of the Urban Council of Caerphilly.

Mr. Balfour Browne: I am opposing the Bill of the Caerphilly District Council; and if your Lordships pass that Bill, a portion of my Bill which goes far outside the Caerphilly district will be struck out, and it will then be an absolutely unopposed Bill.

Mr. Freeman (continuing) said in the year 1893, Caerphilly was included in the district of the Pontypridd Rural Sanitary Authority. In that year, the Glamorganshire County Council formed part of the parishes of Eglwysilan and Llanfabon into an urban district; the other parts of the district being united to the adjacent parishes of Pontypridd, Mountain Ash, and Merthyr Tydfil. While Caerphilly remained a part of the Pontypridd Rural Sanitary Authority's district, water-works were constructed for parts of it; and in 1892, the same authority constructed water-works for the supply of Nelson—a large village in the parish of Llanfabon—the other works being situated in the valley of Eglwysilan. Though they were referred to as water-works, they were exceedingly unsatisfactory; consisting as they did, merely of small tanks on the hillside, not at all such works as the Sanitary Authority desired to supply the district with. The Pontypridd Water-Works Company were supplying the Taff portion of the district at the present time; but they had not furnished water to any portion of the district situated in the Rhymney Valley. In fact, last year, by a formal resolution, the Pontypridd Water-Works Company abandoned the portion which was in the Rhymney Valley to the Caerphilly Local Authority. In the year 1892, three Water Bills had been introduced. The first was the Pontypridd Water Bill, the object of which was to construct water-works and to raise capital for the supply of those portions of Eglwysilan which, together with Llanfabon, were being formed into the urban district of Caerphilly. The second, called the Rhymney Valley Gas and Water Bill, proposed to incorporate a Company for the purpose of supplying, among other places, that part of Llanfabon parish then being formed into an urban district. The third Bill was the Llanbradach District and Aber Water Bill, the object of which was to incorporate a local Company for supplying water to those portions of Caerphilly situated within the Rhymney Valley. So their Lordships would see that the Llanbradach Bill was directly competitive with the Pontypridd Bill and the Rhymney Valley Bill. The Pontypridd Bill, against which the Llanbradach Company had not presented any petition, was passed and became an Act. The Rhymney Valley Bill was passed pure and simple in the House of Lords; but when it reached the Commons, it was opposed by the Pontypridd Rural Sanitary Authority on the ground that if passed in its then form, it might prejudice the newly-formed Caerphilly authority in supplying water under the Public Health Act. A proviso was therefore inserted "that if in any parish or part of a parish within their limits the Company shall have failed to make adequate provision for the supply of water for domestic purposes within the period fixed for the completion of the water-works, the restriction on the construction of water-works imposed by section 52 of the Public Health Act 1875, shall not in respect of the Company apply to, or be binding upon the Local Authority as defined by that Act." The time for the completion of the works was cut down from five to three years so far as the parish of Llanfabon was concerned; and five years was given to all the rest of the territory. The effect of this was that, if the Rhymney Company did not construct their works in the parish of Llanfabon, and get their water within three years, nothing was to prevent the Caerphilly authorities from themselves constructing the works. The third Bill—that of the Llanbradach Company—was rejected mainly on the opposition of the Pontypridd Company, who alleged that the new Company were about to invade their statutory territory.

Mr. Balfour Browne said the Llanbradach Company were not going to invade the territory of the Pontypridd Company, but to take the piece which the Rhymney Gas and Water Company desired; and it was upon the opposition of the Rhymney Company, that the Bill was rejected.

Mr. Freeman maintained that it was rejected mainly on the opposition of the Pontypridd Company, for the reasons he had stated. The contention of the Caerphilly authorities was that the restriction of the 1892 Act having lapsed, they were free to supply water, because the Rhymney Company had not complied with the statutory powers, and the Pontypridd Company had surrendered their powers. Though the Rhymney Company were supplying water in Llanbradach from a source which the Caerphilly authority alleged was not their statutory source, it was not considered a fair thing to come and set up a supply against the Rhymney Company supported by the rates, without in the first instance offering to buy so much of their undertaking, statutory or non-statutory. So it was proposed to buy up the portion of the Rhymney undertaking which was at present supplying water from the Town Brook in the Llanbradach district. While this could easily be done, and the Caerphilly authority would then have no competition in the district if the Bill now promoted by the Rhymney Company was passed, they would have a further period of seven years in which to exercise their powers; and during

this period the Caerphilly authority would have no right to set up a competitive supply. It was impossible for Caerphilly to last anything like that period; and what was proposed by the Rhymney Company was not at all a satisfactory source of supply. The Caerphilly district had an area of 17,000 acres, its population was 11,000, and its rateable value was £32,264. The outstanding loans were £5000; and the Council had undertaken to construct sewerage works for the district, at a cost of about £35,000. The distance between the top and the bottom of the district was about nine miles; and in the centre of it were Caerphilly with a population of 2500, Llanbradach with a population of about 1600, Sengenhydd with 1200, Aber with 200, and Nelson with about 1700. The importance of the case lay in the fact that the main portion of the district was situated upon a coalfield, the very valuable steam coal in which was practically intact. Deep pits had recently been sunk at Llanbradach; and a mining village had begun to spring up round the pits. There was also a pit being sunk at Sengenhydd, where many houses and several hotels were in course of construction. Building was going on very fast. During the past twelve months a hundred plans for houses had been laid before the Local Authority; and no doubt within the next few years, a very large population, which was estimated at 10,000, would spring up. It was a very common thing for the water supply in this district to run short; and last year there was something not far from an absolute famine. Not merely was there no regular supply, but people had to go a long way to fetch water; and very often when it was obtained it was exceedingly unsatisfactory for domestic purposes. In these circumstances, application was made by the Caerphilly Urban District Council to the Rhymney Water Company last July to know whether they would give any assistance by supplying water at Ystrad Mynach. It was not until October that the Rhymney Company expressed their willingness to supply the water; and by this time the Caerphilly Council had determined that it was necessary to take some steps in the matter themselves. They had therefore determined to promote the Bill before the Committee, in order to meet the requirements of the whole of their district. With reference to the gas part of the Bill, all that it was necessary to say was that in 1892 the Rhymney Company obtained power to supply gas within certain limits; but they had never supplied any gas at all in Llanfabon, which was part of their area, with the result that the Caerphilly Council had had to light it themselves with oil-lamps. Though the Rhymney Company were perfectly aware of this, they did not render any assistance; and they had no objection to its going on. There were also in the district two small Companies—the Taff's Well Company and the Caerphilly Company—who, without statutory powers, had supplied gas for some time. The Caerphilly District Council proposed to buy these two Companies on arbitration terms, and supply gas themselves. The Companies were perfectly willing to be taken over. By a clause of the Bill it was provided that the Caerphilly District Council shall not supply gas within that part of Llanfabon in which the Rhymney Company are authorized to supply without the previous consent of that Company; so that, if the Rhymney Company did their duty, the Caerphilly Council did not desire to interfere with them in the supply of gas. On the other hand, if the Rhymney Company did not do their duty, the Caerphilly District Council desired to supply gas themselves.

Witnesses were then called on behalf of the promoters.

Mr. *W. Thomas*, a member of the Caerphilly District Council, examined by Mr. Coward, explained that the general feeling of the district was in favour of the Caerphilly Bill, and strongly reverse to the Rhymney and Aber Valley's Bill; and that there was a pressing need of a better water supply in the Caerphilly district, which had not been furnished by the Rhymney Company in spite of urgent applications. The Caerphilly Council had carefully considered the scheme before the Committee, and all the possible sources of supply in the neighbourhood, with the result that those selected appeared to be the only suitable ones. Having regard to the expected growth of the district, he looked upon the scheme proposed as being imperatively necessary.

Cross-examined by Mr. Shaw: The Rhymney Company's scheme was intended to supply Ystrad Mynach; and their mains were now laid from Maes-y-Cwmmer to Ystrad Mynach. So far as Llanbradach was concerned, the supply was ample; and the Company had offered to supply water at 9d. per 1000 gallons. But the Caerphilly District Council would not have it at that price, seeing that they would have, in addition, to go to the expense of laying the mains. They preferred to get a better supply of their own. The promoters had taken the Cwm Ifor reservoir out of the Bill, and so arranged with Lord Bute; but the Cwm Ceffyl reservoir, which was on Lord Windsor's property, was absolutely vital to the scheme.

Cross-examined by Mr. Williams: Until the population increased in the district, it would be necessary to have a rate-in-aid for the repayment of interest on borrowed capital; and he supposed the principal landowners—such as Lord Windsor and the proprietors of the Thomas estate—would have to find the greater part of the rate. But this would only be for a short time. £55,000 was the amount to be expended under the Bill; and of this £38,000 was for water. Besides this, there was the £38,000 for the sewerage scheme, or about £90,000 altogether. As a penny rate only produced £134, he admitted that it was rather a large order; but it could not be helped.

Dr. *W. Thomas*, Medical Officer of Health to the Caerphilly Urban District Council, then gave evidence to the effect that there had been epidemics of typhoid and diphtheria in the district, which he attributed to the scarcity of water and the bad drainage. As the district was developing very rapidly, it was a matter of urgent necessity that there should be a better supply of water.

Mr. *A. O. Harpur*, Surveyor to the District Council, testified to the fact that they had been constantly pressed by the County Council to provide water for the people in the Caerphilly district.

Mr. *G. G. Lewis*, Chairman of the Caerphilly School Board, and a Director of the Gas Company, expressed the opinion that it was for the advantage of the district that the Local Authority should purchase the gas-works and supply gas themselves.

Mr. *W. Galloway*, Professor of Mining at the University College of South Wales and Monmouthshire, having examined the sites of the proposed reservoirs, had come to the conclusion that they were well selected for the purposes of a gravitation scheme which would not interfere with the collieries.

Mr. *Conyers Kirby*, Borough Engineer and Consulting Surveyor to the county borough of Newport, gave it as his opinion that the streams from which it was proposed to obtain water would, together with other supplemental sources, afford an adequate supply for some generations. It was impossible in this district to go outside the coal measures, especially in supplying water to small places. It was proposed to take the streams which were most useful and constant. In the case of those of which the flow was small, it was intended to take the whole—giving a small amount of compensation to the mills.

Monday, March 22.

When the proceedings were resumed to-day,

Mr. *Kirby*, recalled and cross-examined by Mr. Williams, admitted that if the Rhymney Bill passed, the ratepayers would not have to subscribe to the £38,000 which the Caerphilly water-works were to cost; but he said they would have to pay the maximum rates for all time, whereas he did not think they would have do so if the Caerphilly Bill were passed. For the first two or three years, the present supply, with the assistance of the subsidiary works, would be sufficient: and his impression was that the present charge of 2d. per week in the case of small houses would suffice. The works proposed would be sufficient for ten years or more. He did not apprehend that the whole of the £38,000 would be expended in the first ten years. He certainly took exception to the assumption that the £38,000 would be spent in the first two or three years. It was not proposed to construct the Cwm Ifon reservoir at once; and it would take two or three years to make the others. With the subsidiary works, *plus* what they had at present, they could give a fairly sufficient supply of water while the works authorized by the Bill were proceeding. Both the water and gas works would be remunerative in a place like Caerphilly; and when the land became developed for building purposes, the lessees and occupiers, and not the owners, would have to pay the rates necessary to defray the interest and sinking fund.

Mr. *G. F. Deacon*, M.Inst.C.E., examined by Mr. Coward, said his opinion was that, if proper care were exercised, there would be no difficulty, under the Caerphilly scheme, in giving a constant supply of water, at high pressure, of 18 gallons per head per day as a maximum. Fifteen gallons per head per day could be obtained quite easily. Taking 18 gallons as the maximum, there would be sufficient water to supply 26,322 persons. The quantity taken in relation to that flowing past the nearest mill below the reservoirs, was exceedingly small. At no moment was it likely to exceed 18 per cent.; and the total quantity in the driest year, from mid-winter to mid-winter, was only about 8½ per cent. As a matter of drainage area, it was 19·5 per cent. The total area which drained down to the mill was more than five times as great as the two areas draining into the reservoir taken together. But the whole of the water could not be intercepted; and if the effect of this were taken during a dry year, it would bring down the quantity to between 8 and 9 per cent. During an extremely dry season, the ratio would be one-fifth. He understood that the mills were disused; and in respect of the collieries, it would be very much cheaper for them, if a reasonable price were agreed upon, to take their water from the Caerphilly works than to pump it themselves, because it would be proportionately much more expensive to make such comparatively small works as would be required to supply the collieries than it would be to carry out the Caerphilly scheme. The colliery companies, by putting in small reservoirs, had spoilt the drainage area. He did not know whether they had actually commenced pumping operations at the principal collieries; but they must be lifting water.

The Chairman: When you say that it would be cheaper for the collieries to take the water from the Caerphilly District Council, do you mean that no compensation would be necessary?

Witness: Yes.

Examination continued: He had inspected the drainage area and the site of the proposed reservoir under the Rhymney and Aber Valleys Company's Bill, which was supposed to be capable of containing 130 million gallons. The drainage area was 7966 acres, of which about 170 acres were limestone to the surface, and 320 acres millstone grit over the limestone. The area of limestone to the surface could not be counted on for supplying the reservoir, and no portion of the millstone grit area—water from which must rise over the limestone. The carboniferous limestone was more or less fissured and cut away by chemical action, which was greater in the lines of the valleys. There were no means of ascertaining, except by superficial investigation, what was the exact condition of the limestone in the area in question; but it was literally almost covered with swallow-holes, some of them as much as 150 feet in extent and 30 or 40 feet deep. These swallow-holes were not confined to the limestone, but were found also in the millstone grit overlying the limestone. In the first place the limestone had been carried away; and then the millstone grit had been unable to support its own weight, and had gone down. It was to be found in huge blocks at the bottom of the swallow-holes. By putting an ear to the blocks, one could hear the water running below. There was no visible water at all, until one came to a place at the bottom of the valley about halfway from the reservoir. The water first became suddenly visible a short distance above the proposed reservoir. After heavy rainfall, the quantity which he measured was 492,000 gallons a day, which was as nearly as possible equal to 1 cubic foot per second per 1000 acres. At another gauging, close upon the site of the proposed reservoir, the quantity had increased from 1·08 to 3·02 cubic feet—that is, it increased three times in relation to the area. This increase did not satisfy him, so he went down to another place and made local inquiries; and hearing of the springs which had been already spoken of, he examined them and gauged the stream below them. There he found the intensity of the flow had increased to 7·2 cubic feet per second per 1000 acres. If these were good water-works drainage areas, and if the water were coming off the millstone grit area without limestone below it, the flow would probably be 4 cubic feet per second per 1000 acres at all places. The result of the figures he had given was, in his opinion, to show that the Rhymney reservoir would not be water-tight with a bank carried up 100 feet, though it might be so if it were only a small reservoir. The water came into the stream between the first and second gaugings; and when a head of water was put upon this, the water would flow out into the limestone, or possibly into the millstone grit. The most serious thing that would have to be reckoned with in the construction of the Rhymney Company's reservoir was that

the water went into the ground, and came out again half a mile below the reservoir.

Mr. COWARD: Do you think that the reservoir could be made for anything like the £8000 proposed?

Witness: I am unable to say that the estimate would not cover the cost of the construction of the reservoir. My point is that it would not yield a sufficient quantity of water. I have not examined the estimate.

Cross-examined by Mr. BAGGALLAY, for the Rhymney and Aber Valley Company: He was quite sure that a very large amount of the water which fell above the site of the proposed reservoir would give them the slip, and flow down the valley.

Mr. BAGGALLAY: You seem to think that, in the case of the Aber, which is a small brook, you can take water without giving compensation; and that with the Rhymney river, compensation should be given?

Witness: The Aber brook includes a very small area; and the compensation should be confined to a very short distance, as the interests could be easily dealt with afterwards. It would be not only cruel, but inexpedient from a public point of view, to rob this district of any portion of the water, and force them to obtain it where the cost is so great as to be out of all proportion to the value. Nobody could be injured by the construction of the Caerphilly reservoir, unless it were some of the mills below the reservoir; and these only to a very limited extent.

Cross-examination continued: Personally he did not know of any instance in South Wales of water being taken from a river without compensation being provided in some form; but there were any number of cases which had not been tested at all. He did not know that the Pontypridd Company, in order to protect their Mardy reservoir, had had to purchase all the upper seam of coal underneath it. He knew that the steam coal was being worked in the neighbourhood.

Mr. BAGGALLAY: If the Pontypridd Company were served with notice that the upper seam was going to be worked, and consequently were obliged to purchase the coal, probably the same thing will happen when they get notice to work the lower seam?

Witness: I know very little about it.

Cross-examination resumed: It would require 473,000 gallons to give 18 gallons per head per day; but he was afraid he could not answer exactly how much the Caerphilly District Council could collect off their gathering ground in dry weather.

Mr. BAGGALLAY: That is important to know.

Witness: It is not indeed.

It is for my purpose. If Caerphilly increased so much that it required to seek outside its own district for water, would not the head of the Rhymney Valley be the natural place to go to?—Other things being equal, it would; but if the head of the Rhymney Valley is unsuitable for reservoir making, it would not. Having regard to the great distance to the head of the valley, it would be better to supply the Caerphilly district from local sources. The district through which the water supply would have to be taken is too thinly populated to make it remunerative.

Cross-examination continued: At 18 gallons per head per day for 26,000 persons, there would be about 52 days' storage in the three reservoirs proposed by the Caerphilly District Council; and the Caerphilly reservoir was capable of supplying the district during the longest period of drought ever known in the neighbourhood.

The CHAIRMAN: What do you calculate to be the inflow of water daily to your three reservoirs?

Witness: During the whole year, the daily inflow is about 800,000 gallons, after taking off the evaporation from the rainfall.

Lord CLIFDEN: Supposing there was no inflow, for how many days would the reservoir supply 18 gallons per head to 26,000 people?

Witness: 52 days.

Mr. BAGGALLAY: The 800,000 gallons per day is on an average for the whole year; it is not the amount that would be coming in during 52 days of drought. What is the lowest figure that goes to make up the average of 800,000 gallons?

Witness: The gauging of 46,000 gallons a day was a drought gauging taken on the 31st of August last year. During the whole of that month, there had been only 3½ inches of rain. It was a very dry month.

Cross-examined by Mr. SHAW: He did know that the rainfall was 3½ inches during the last few days in August. The gauging was taken in the Taff Feehan Valley, which was 20 miles away. He had no experience of sinking or working collieries; and he could not say how much water a colliery would consume. The amount varied enormously.

Mr. SHAW: Supposing that 200,000 gallons a day of clean water is necessary in a large colliery for the boilers alone, and all the available supply is taken, how much would that leave the people to consume?

Witness: 273,000 gallons a day; but I do not think any of these collieries would require so much water.

Mr. SHAW: That is only one colliery.

By Lord WENLOCK: He would not advise the Caerphilly District Council to buy the coal measures below the site of the proposed reservoirs, because they were small reservoirs, and the coal measures were deep down and could not affect the stability of the reservoirs if the coal were worked.

Mr. *D. Lewis*, Clerk to the Caerphilly Urban District Council, having given a series of figures showing the growth of the district,

Mr. FREEMAN intimated that this concluded the evidence on behalf of the promoters.

Mr. *M. J. Rees*, Consulting Engineer to the Windsor Colliery, was then called and examined by Mr. SHAW. He stated that the collieries had a capital of £200,000; and that the area of their property was between 2000 and 3000 acres, of which over 1000 acres were in the Caerphilly district. In choosing a site for a colliery, one of the first points taken into consideration was that there was an ample water supply; and the Windsor Colliery Company had the right to take water for working and developing minerals from two of the streams upon which the Cwm Ceffyl and Cwm Ifor reservoirs would have to depend for their supply. From these streams, the Colliery Company took water by gravitation; and when they wound 2000 tons of coal a day, as they hoped to do, they would require 150,000 or 200,000 gallons of water a day for their boilers alone. Besides the boilers, there were a great many other purposes for which water was needed. For instance, if they went in for coking, they would want water to wash the coal and cool the coke. They were bound also to keep the underground roads watered. He did not know of any other water that they could obtain on the spot, with the exception of that from the Aber River, which was dirty, and would become dirtier still as the colliery working increased. It was impossible, as had been suggested by one of the witnesses, to eke out the water they obtained from the streams by that they pumped from the colliery. In all his experience—which extended over 26 years—ample compensation was given to collieries in such cases as this. In this particular instance, money compensation would be useless.

Mr. *T. Griffiths*, another Mining Engineer from the Rhondda Valley, having given corroborative evidence,

Mr. SHAW addressed the Committee on behalf of the Windsor Colliery Company in opposition to the Bill.

Tuesday, March 23.

At the commencement of the proceedings this morning,

Mr. FREEMAN said the very last thing the Caerphilly Urban District Council desired to do was to hinder the development of Lord Windsor's mineral property, or that of his tenants. It had therefore occurred to them to try and modify the Bill in such a way that the Council might be able to get the whole of the water they required, without causing any inconvenience to these persons. Having consulted with his clients, he was prepared to make a suggestion in the hope that an agreement might be arrived at. The brook in which Lord Windsor was principally interested was the Cwm Ceffyl, in respect of which it was proposed to construct a reservoir holding 14 million gallons. As the Bill stood, the District Council would have the power to take all the water they could store; leaving the overflow to go down to the persons below—that is to say, the Council could actually take and store 273,000 gallons a day, and the overflow would amount to 480,000 gallons. What the Council offered was that they should not take more than half the flow of the stream that went past Cwm Ceffyl—that they should be entitled to impound 219,480 gallons in their reservoir, and allow the remainder of the flow to go down to the people below. This, *plus* the overflow, would give Lord Windsor and his tenants and other riparian tenants 534,292 gallons.

The CHAIRMAN: Upon what is the calculation of 219,480 gallons based? Is it upon the dry-weather flow?

Mr. FREEMAN: Yes.

Mr. PEMBER: This is an eloquent comment upon what I have stated about this being a patched-up scheme. It shows the necessity for further patching; for not only does it profess to be a compromise with Lord Windsor, but something in the nature of a substitution for compensation. Inasmuch as in the winter there is a great deal too much water, and in the summer a great deal too little, the theory of compensation is the discharge down the river of an equable flow—something much better than the dry-weather flow, but nothing like the winter flow. Unless there are special circumstances to the contrary, the quantity of water restored to the river by way of compensation generally amounts to one-third of the available rainfall. What is offered in this case is nothing approaching that quantity; and I reject the proposition altogether. The learned Counsel then proceeded to address the Committee on behalf of Lord Windsor, in opposition to the Bill. He said his Lordship viewed with the greatest alarm the proposal to postpone for ten years the prospect of obtaining a proper supply of water in the district. Against a good and sufficient scheme, Lord Windsor would have nothing to say; but he did feel bound, not only in the interests of his lessees but in those of the district as a whole, to very seriously protest against the passing of a scheme which was exactly the opposite to what his Lordship would desire to see.

Mr. *T. F. Brown*, Lord Windsor's Mineral Agent, was then examined. He said the Rhymney Valley Gas and Water Company could supply water to the district generally; and they had a surplus which might be given to Caerphilly. In the Aber Valley, a very large quantity of pure water for the generation of steam, and polluted water for coke washing, condensation, and so on, would be required immediately; and perhaps in the course of six or seven years, when the collieries were fully developed, there would be a population of about 15,000. During this time it would be quite possible to supply the gradually increasing number of inhabitants from the local tributaries, until a sound scheme for bringing water into the district was proposed.

Lord WENLOCK: Where are they to get their water from eventually?

Witness: Outside the coalfield. There is not enough water in the district to furnish a pure supply. As to whether the Rhymney and Aber Valleys Gas and Water Bill contains the proper scheme, I cannot say.

Mr. PEMBER: It would be perfectly feasible to get a good supply at a short distance?

Witness: Yes.

If their Lordships reject the Caerphilly scheme, there would be a delay of a year. Would it, in your judgment, be possible to devise a really good and feasible scheme in the course of the next twelve months?—No doubt if the Rhymney scheme is not sound, the present inquiry would give the Caerphilly District Council such information as would enable them to see what is the proper course to adopt. The Caerphilly scheme is a makeshift, of which I do not approve.

Speaking as Lord Windsor's responsible adviser, should you view with anything approaching dismay or apprehension the delay of a year in coming for a really good sensible scheme?—No. Caerphilly could be supplied in bulk by the Rhymney Valley Gas and Water Company; and Nelson could be supplied from Merthyr or Cardiff.

This closed the case for Lord Windsor; and the following evidence was then called in support of the opposition of the Messrs. Goodrich.

Mr. *H. St. Aubyn Goodrich*, joint owner of mills which derive their water supply from the Aber brook, deposed that in dry weather there was barely enough water for the purposes required. In his opinion, water should not be taken out of the district, but brought into it from the Taff or Rhymney Valleys.

Mr. *F. Morgan*, son of the tenant of one of Messrs. Goodrich's mills, corroborated the preceding witness; and stated that in summer they were frequently only able to run the mill for one hour out of the 24.

Mr. *A. Austin*, son of the tenant of another mill, said that during the drought of last summer, his mill was stopped between three and four months.

Mr. BAGGALLAY addressing the Committee for Messrs. Goodrich, asked their Lordships to refuse to sanction a scheme which did not provide water compensation.

Mr. BALFOUR BROWNE, on behalf of the Rhymney and Aber Valleys Gas

and Water Company, the promoters of a scheme for supplying the whole valley with gas and water, contended that the Rhymney Valleys Company were already in possession of the Llanbradach district; and he asked that it should not be taken away from them by the Caerphilly District Council without proof of any default on the part of the Company, who had more than sufficient water for the supply of the area. He did not say that they were able to afford a permanent supply, the only hope of which lay in going to the millstone grit, and making a large reservoir there. The Caerphilly scheme, he urged, was bad from an engineering point of view; and not only would it not afford a permanent supply, but it was inadequate for present requirements, and did not give compensation water. The learned Counsel then intimated that he would call evidence to rebut the case of the Caerphilly Urban District Council.

The CHAIRMAN: The Committee have made up their minds that upon this point they will only hear one witness.

Mr. *Togarmah Rees*, M.Inst.C.E., said that, in his opinion, there would be no difficulty in constructing the Gelligaer reservoir of the Rhymney Company. He was satisfied as to the suitability of the soil. He also considered the catchment area would give a sufficient supply of water; and he was not afraid of the swallow-holes.

Cross-examined by Mr. FREEMAN: Having heard the mining evidence, he was of opinion that Caerphilly should not get water in this district, but should go outside. He did not consider Cwm Ceffyl a desirable site for a reservoir, on account of the fear of subsidence. He had experience of placing reservoirs on coal measures where it had not been necessary to purchase the coal underneath. At the greatest period of drought, the Rhymney Valley Company could furnish 26,000 gallons a day to the Caerphilly district, without interfering with their own supply. They had offered to supply Llanbradach, with a population of 600, at 9d. per 1000 gallons. Under the 1892 Act, they had power to supply Llanbradach from the Llanbradach brook; but they had not done so up to the present. They, however, hoped to do so in the future; and with this object, they sought to extend the time for the exercise of these powers. They had a tank supplied from a spring at Llanbradach, under an agreement with the landowners—not under any parliamentary authority; and they had undertaken to supply the district with water. It was not necessary that it should be supplied from the Llanbradach brook.

Mr. FREEMAN: The result of the present works does not afford very good credit, does it, on which to raise the sum asked for in your Bill?

Witness: We hope for better times.

Mr. FREEMAN, before replying on behalf of the promoters, asked the Committee to hear the case of the Rhymney and Aber Valleys Company, on the ground that if it could be shown that there were such strong objections to the Rhymney Bill that it could not be allowed to pass, it was very material that the Committee should be made acquainted with all the facts before deciding on the Caerphilly Bill.

After the Committee had deliberated in private,

The CHAIRMAN said the Committee were of opinion that the Caerphilly Bill should be dealt with on its merits.

Mr. FREEMAN then referred to the various points urged against the Caerphilly Bill; and said that it was a matter of universal agreement that certain parts of the district were extremely short of water. Further, that a better supply was imperatively needed in the immediate future; and that there were no means of dealing with the question in any permanent way, except by the scheme of the Caerphilly District Council and that of the Rhymney and Aber Valleys Gas and Water Company, to which the opposition was very severe.

The CHAIRMAN said that, whatever the decision might be, he thought it only fair to state that the Committee found no fault whatever with the conduct of the Caerphilly Urban District Council.

The room was cleared; and on the re-admission of Counsel and parties interested,

The CHAIRMAN intimated that the Committee had decided that the preamble of the Bill was not proved.

HOUSE OF COMMONS COMMITTEE.

Friday, March 12.

(*Before Mr.* JEFFREYS, *Chairman; Mr.* VAUGHAN DAVIES, *Sir* CAMERON GULL, *and Mr.* D. FORD GODDARD.)

CROWBOROUGH DISTRICT WATER BILL.

This Bill, by which power is sought to incorporate the Crowborough District Water Company, with the object of constructing works and supplying water within the parishes of Rotherfield, Willingham, and Buxted came under consideration to-day.

Mr. LITTLER, Q.C., and Mr. BATTEN appeared for the promoters; Mr. READER HARRIS, Q.C., and Mr. G. D. FITZGERALD, Q.C., for the opponents of the Bill—the Conservators of the Upper Medway, Messrs. Curtis and Harvey, and representatives of the late Mr. H. Warden.

Mr. LITTLER having set forth the objects of the Bill, for the purposes of which it is proposed to raise capital to the amount of £30,000,

Major *H. C. Malden*, a member of the Uckfield District Council and the Rotherfield Parish Council, was called and examined by Mr. BATTEN. Having explained that he gave evidence in his private, and not in his official capacity, witness stated that Crowborough Beacon was the highest inhabited spot in Sussex, being 800 feet above the sea; and that it was an exceedingly picturesque place. The air being particularly dry and invigorating, and the locality bracing and healthy, there were a number of visitors at all times of the year, more particularly in summer. During the past few years, the place had rapidly grown in public favour; and many large and small residences had been built. Water was at present obtained from wells at varying depths above the clay, and also from springs. The supply from these wells sufficed when the population was scanty. Though several of them often ran dry in the summer, there was generally water to be obtained by cartage from one or other of the springs. With the growth of the neighbourhood, the question of water supply had become a serious one. The projected establishment of water-works had been very favourably received by the inhabitants, who were exceedingly anxious for their completion, and a resolution was unanimously passed by the Uckfield Rural District Council in favour of the proposed undertaking. The scheme was generally approved by the members of the Rotherfield Parish Council; and but for the fact that it had been suggested that the Company would prevent individual inhabitants from themselves fetching water from Lord's Well and other open springs, which they had been accustomed to use for many years, there would probably be no difference of opinion as to supporting the measure.

Mr. *Griffin*, a medical practitioner at Crowborough, expressed an opinion strongly favourable to the proposed scheme, and explained that at present, without a proper water supply for flushing purposes it was impossible to carry out an efficient drainage system.

Mr. *A. Williamson*, Assistant Steward to the Marquis of Abergavenny, at Eridge, also gave evidence in support of the Bill, and informed the Committee that the Marquis had agreed to sell some of his land upon which to construct the necessary works.

Engineering evidence was then given, to the effect that it would be possible under the scheme to supply 20 gallons per head per day to a population of 4000 people. Mr. E. H. Moore, Public Analyst for Brighton and for the county of Sussex, bore testimony to the suitability of the water sought to be supplied; and Mr. A. Turner gave evidence to the effect that there would be no difficulty whatever in raising the necessary capital.

This concluded the promoters' case.

Tuesday, March 16.

On the resumption of the proceedings to-day,

Mr. FITZGERALD addressed the Committee on behalf of the Medway Navigation Company and Messrs. Curtis and Harvey.

Mr. *Stow*, the Secretary of the Medway Company, Mr. *Hobgen*, the Manager of Messrs. Curtis and Harvey's Powder Mills, and Mr. *Reading*, the Manager of the Chufford Mills, were then called to show that the proposed works would prejudicially affect the undertakings with which they were connected.

Mr. *Baldwin Latham*, M.Inst.C.E., who was the next witness, expressed the opinion that the works proposed by the Company seeking incorporation were ill-designed and inadequate, and that no proper provision was made for giving a sufficient quantity of compensation water to the mills and various other works.

Wednesday, March 17.

Mr. *Baldwin Latham* was this morning examined by Mr. D. FORD GODDARD. He stated that he had never before known a case in which a private Company had been allowed to supersede the Local Authority in the matter of water supply. The stream from which it was proposed to serve the district with water was polluted from its source downwards. At present, water was taken by the inhabitants of the district from springs and wells, and not from the stream at all.

Mr. BATTEN: The gentlemen who live in this district say there is a dipping well in the middle of the stream from which the people take their water. Will you ask the witness whether this is not the case?

Witness: I have been there many times, and I have not seen any water drawn from the stream for domestic purposes. If you saw the stream in the summer time, you would say that no one would dream of taking water from it for such purposes.

Mr. GODDARD: In your view, is the filtration proposed insufficient?

Witness: It would not purify the sewage contaminated water.

Have you tested the water?—No, I have not; but I know it is always turbid.

That does not necessarily make it bad?—No; it could be purified by subsidence and proper filtration.

You suggest that the money proposed to be expended is not nearly sufficient?—Certainly I do, in the case of a water scheme for a district of this area, and including the provision of compensation water. It is a very small sum indeed without the compensation.

In a population of 9000 there must be a large number of people who will not be supplied with this water?—Yes, a good many will still be left to their own local sources.

Therefore in estimating the quantity of water required, it would not be fair to take the whole population of the district?—Yes, it would, for the reason that no allowance is made for the future population.

If the population grows rapidly, the Company will have to come to Parliament for further powers. With those which they propose to take, is there sufficient money to carry out an efficient scheme?—With the whole of the capital which it is proposed to raise, no doubt there is.

Mr. READER HARRIS then addressed the Committee in opposition to the scheme, which, he submitted, was bad alike on sanitary and engineering grounds, and in regard to the damage it would cause to the millowners. Mr. Baldwin Latham, with his unparalleled experience, had described it as the maddest scheme he had ever known. No greater disaster could fall upon the district than obtaining this water, which was impure, and unfit for domestic purposes. It was the universal custom of Parliament to require an overwhelming case of public need to justify interference with private rights; and in the present instance he contended that no such case had been made out for a scheme which would be a very serious detriment to the business of the millowners, and render their works less valuable by reason of a restricted supply of water.

Mr. LITTLER, replying for the promoters, claimed that they had laid before Parliament a perfectly satisfactory scheme, and if it was sanctioned an increase of building and an adequate drainage scheme for the district were sure to follow. If the Committee decided that the millowners were to have the compensation water for which they asked, it would either make it impossible to go on with the Bill, or it would necessitate the construction of compensation works at considerable cost. He maintained that the millowners would not sustain the smallest possible damage; and their only object in trying to get compensation water was, he said, that they might be able to sell their right to it for a lump sum.

The room was then cleared. After the Committee had consulted for a short time in private, the Counsel and parties were re-admitted.

The CHAIRMAN stated that the Committee had decided to pass the preamble of the Bill, subject to the reduction of the time for the construction of the works from five years to four, and to a certain revision of the charges for water which would form a matter for discussion when clauses were being considered.

HOUSE OF COMMONS COMMITTEE.

Monday, March 15.

(*Before Mr.* JOHNSON-FERGUSON, *Chairman, Captain* BOWLES, *Mr.* C.E. SCHWANN, *and Mr.* BEMROSE.)

LEEDS CORPORATION BILL.

This Bill, which, among other objects, is to enable the Corporation of Leeds to purchase land for carrying out works in the Washburn Valley, to provide a better water supply to the borough, and to make bye-laws in connection therewith, came before the Committee to-day.

Mr. PEMBER, Q.C., and Mr. G. FITZGERALD appeared for the promoters; and the various petitioners against the Bill were represented by Mr. LITTLER, Q.C., and Mr. ERSKINE POLLOCK, Mr. PEMBROKE STEPHENS, Q.C., and Mr. LLOYD, and Mr. WORSLEY TAYLOR, Q.C., and Mr. RICHARDS.

Mr. PEMBER, in opening the case, said that, though the Bill comprised several matters, he would confine himself for the present to those which dealt with the purchase of land for the execution of water-works in the Washburn Valley, where the reservoirs belonging to the Corporation for the supply of water to Leeds and to the affiliated districts, were situated. It contained a population of about 400,000; and it passed through various estates belonging to different owners. He might mention that the Corporation had some thought of constructing additional reservoirs up the valley; but the idea had been given up, at all events for the present. The responsibility of the Corporation, as the suppliers of water to a very large population spread over an extensive area, was very great indeed; and they had seriously to consider whether, in view of present sanitary requirements, they ought not to imitate several of the great Corporations in England, Scotland, and Wales in buying up the land which composed their area of water supply. Leeds was, after London, the largest municipal area in England. The population was 400,000 (he used round figures) in the census of 1891; whereas it was only 207,000 in that of 1861. So that in thirty years it had almost doubled. It had an area of 21,500 acres; and the circumference was about 30 miles. It had a rateable value of £1,500,000; while it was only £500,000 thirty years ago. He did not think he said too much when he stated that the system of water supply was one of the finest in the country; and it was obvious that the preservation of its purity was of the utmost moment. If they excepted three instances—Manchester, Liverpool, and Glasgow (and, of course, London)—the population was the largest in the kingdom which was supplied by one system of water-works. The daily consumption was now 15 million gallons; while it was only 4½ millions thirty years ago. It had therefore multiplied between three and four times. The history of the undertaking itself was of considerable interest; but it was not essential that he should touch upon it in giving an explanation of the objects of the Bill. For years past the Corporation had viewed with apprehension the pollution of the Washburn supply from such sources as farmyards, cesspools, drains, dwellings, and so forth; and they appointed a Sub-Committee some time ago to consider the matter. On Nov. 17, 1894, they reported to the Corporation that they had been engaged for three days in the inspection of farms and other buildings from which offensive liquid matter was allowed to flow and percolate into the reservoirs and streams; and this and previous inspection showed that the drainage arrangements of no less than seventeen properties were in a defective condition and caused a nuisance which seriously affected the quality of the water. Now, though the Corporation were responsible for the purity of the water supply in the Washburn Valley, and the body to whose constituents it was of vital consequence that there should be no pollution, they were not the legal authority in the district in which the works were situated. This made all the difference, as it was not likely that the local authority would be very anxious to spend the public money against their own constituents for purposes in which they had no interest whatever; and he need not add that the creators of the mischief themselves did not facilitate matters. The Corporation had appealed to the West Riding Rivers Board; and they also issued a report very much to the same effect as their appeal. They pointed to a great number of instances in which there was undoubted pollution; and they rather accentuated what the Corporation Committee reported. They named five or six villages, none of which had any systematic drainage. What the Corporation desired was to prevent the pollution of the water in their reservoirs, occasioned solely by the want of systematic drainage of the surrounding villages, especially in the time of heavy rains. The result of this pollution was that the Corporation had come to the conclusion that the existing remedies were insufficient and inapplicable; and they had determined to acquire the properties over which it occurred. For the purchase of the land and other subsidiary matters, the Corporation proposed to spend £410,000. With regard to the four principal petitioners against the Bill, he was glad to be able to say that the Duke of Devonshire had been settled with; and he (Mr. Pember) was not without hope that before they had proceeded very far a settlement would be come to with Lord Walsingham, Mr. Galloway, M.P., and Mr. A. Fawkes, the other petitioners. There was every desire on the part of the promoters to meet the views of the petitioners in a fair and reasonable way. Mr. Fawkes, in his petition, put forward an alternative scheme as far as his property was concerned; but inasmuch as this would involve the taking away of 5500 acres of the Corporation's area of supply, he hoped the Committee would not accept it, except as an addition to the scheme of the Corporation.

Mr. *Thomas Hewson*, M.Inst.C.E., was then called, and examined by Mr. FITZGERALD. He said he had been Engineer to the Leeds Corporation for sixteen years, and for the last ten years had been in charge of the water-works. The population provided with water was 410,000; the daily average supply being 15 million gallons. The number of farms on the land proposed to be taken under the Bill was 434; and the number of dwelling-houses upwards of 100. From most of these farms and houses sewage matter found its way into the streams which flowed into the reservoirs of the Corporation, to the great risk of the purity of the supply. Witness gave particulars as to the pollution of the streams, as shown by the report of the Special Committee of the Council appointed to investigate the matter, and said that the majority of the farms were conducted on old-fashioned principles—no steps being taken to protect the manure heaps from the rainfall. In fact, the farms and cottages contributed much pollution to the streams, without any precautions being taken to prevent it. The Corporation were most desirous of meeting the views of the landowners in every respect. He said unhesitatingly that it was essential, in the interests of the water supply of Leeds and the district, that the drainage of the area included in the Bill should be in the hands of the Corporation.

Mr. FITZGERALD here announced that negotiations with Lord Walsingham had resulted in a settlement, and therefore his Lordship's petition would be withdrawn. He was also not without hope that the other petitioners would be settled with.

Mr. PEMBROKE STEPHENS, representing Mr. Fawkes, said he hoped his learned friend would, at an early stage, state what the terms of the settlements were, and the grounds he had for saying that other agreements would be come to.

In cross-examination by Mr. PEMBROKE STEPHENS, witness said that from the farms and cottages on a portion of Mr. Fawkes's property the discharge from the manure heaps and washings from the closets found their way into the streams. What the Corporation desired was to have control over the drainage of the area from which the pollution of the streams arose. As owners, they would be in a position to induce the tenants to co-operate with them in doing away with the pollution now taking place.

Mr. *W. L. Jackson*, M.P., examined by Mr. FITZGERALD, said that when he was Mayor of Leeds the propriety of promoting a Bill like the present was discussed by the Council, who were unanimously in favour of the proposal. Respecting the principle and scope of the present measure, the Water Committee had come to the conclusion that it was necessary, in the interests of a growing population, that they should keep a most effective control over their water supply, in order to prevent pollution. After serious consideration, the Corporation had come to the conclusion that the only effective way by which they could obtain this control was by adopting the precedent of Birmingham and Manchester, and acquiring the ownership of a sufficiently large area of the watershed. The principle of purchase was a costly one, but it was the only effective one; and assuming that the population could bear the cost, in all probability it would prove the most economical in the long run. It was largely a question of health. Leeds had so preserved its steadiness and certainty of growth that, so far as human foresight could go, it was not at all unreasonable that within thirty or forty years it would nearly double its present size. It was entirely dependent upon this watershed; and apart altogether from the question of cost, there was that of public safety. The Corporation were bound to protect their supply, not only for domestic, but for manufacturing purposes; and it was an important fact that the area in which manufactures could be satisfactorily carried on had of late years been considerably enlarged.

Replying to Mr. SCHWANN, witness said he considered that, for the £410,000 named in the Bill, Leeds would receive an adequate return in the end. Without the watershed, Leeds could not exist. It was worth anything in reason for the Corporation to have the control they desired, because it must be borne in mind that the district was within ten miles of the city, as the crow flies, and that it was not only the present, but also the future pollution that had to be provided against.

The CHAIRMAN at this point asked Mr. Fitzgerald if he had come to a settlement with Mr. Galloway.

Mr. FITZGERALD replied that he had, and that the only opposition remaining was that of Mr. Fawkes.

Alderman *Cooke*, the Chairman of the Water Committee of the Corporation, said the capital expenditure on water-works was something under £2,000,000, including the original purchase from the Water Company. The revenue last year was £111,000; and the working expenses were £22,000—the balance remaining after paying the interest on the debt being £18,182. It was absolutely necessary that the Corporation should have the power of controlling and safeguarding the water supply.

Dr. *J. S. Cameron*, the Medical Officer of Health for Leeds, confirmed the evidence of the previous witnesses as to the pollution of the streams, and said that the water supplied to Leeds was good for domestic and manufacturing purposes. As the Medical Officer of Health he supported the Bill, and regarded the prevention of pollution as of the utmost importance. As far as he could see, the purchase of the whole of the watershed was the only means to attain this end.

The Committee adjourned at this stage; it being understood that Dr. Frankland would be the first witness on the following morning. On the re-assembling of the Committee on the 16th, however, a short adjournment was applied for, with the view of seeing if arrangements could be come to with Mr. Fawkes. Eventually, it was announced that a settlement had been arrived at. The preamble of the Bill was then passed; and the clauses were adjusted the next day.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, April 1.

(*Before Mr. Justice* KEKEWICH.)

Ventnor Gas and Water Company v. Ventnor Local Board—The Question as to the Board's Water Rights.

This case came before the Court on two motions—one by the plaintiffs, seeking to vary the report of the Official Referee; and the other by the defendants, asking that his report might be confirmed. It will be remembered that the original action was brought by the Company for an injunction to restrain the Local Board from using water from certain of the mains for the purpose of watering the streets, free of charge. The plaintiffs admitted that the defendants were entitled to free use of the water from the mains and reservoirs in existence in 1866, when the Company was incorporated, and took over the water-works from the late Mr. A. F. Livesay, who had made an agreement with the Improvement Commissioners, the defendants' predecessors. But the latter claimed to use the water without payment from all parts of the extended system of mains. On this point Mr. Justice Kekewich gave judgment in plaintiffs' favour, with costs. The defendants then took the case to the Court of Appeal, where Mr. J. G. Livesay was called to give evidence;

and, in the result, the judgment of the Court below was modified to the extent of giving the defendants the right to use water not only from the mains and pipes laid by Mr. Livesay, but also from others put down by the plaintiffs in substitution for mains previously provided by him. In all other respects, however, the judgment of Mr. Justice Kekewich was confirmed.* The parties not being able to agree as to the effect of the last order, it was referred to Mr. Ridley, the Official Referee, to inquire and report what mains, &c., came within the terms of the judgment. After sitting for five days, and hearing evidence on both sides, he made his report, accompanied by a signed map or plan, showing the roads and streets which he held to come within the terms of the declaration.

Mr. Bramwell Davis, Q.C., and Mr. Nash appeared for the plaintiffs; Mr. Warmington, Q.C., Mr. Ruegg, Q.C., and Mr. Hamilton represented the Local Board.

There were only three portions of the report to which the plaintiffs objected; and the first of these was not worth insisting upon after it had been explained that the defendants did not put such a wide construction upon the words as the plaintiffs thought they might be meant to bear. The other two objections were argued at some length; but, in the result, his Lordship came to the same conclusion as the Official Referee, and therefore dismissed with costs the motion to vary the report. This he adopted and confirmed; but made no order as to the costs of the inquiry before the Referee.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Wednesday, March 31.

(*Before Baron* Pollock *and a Special Jury.*)

Fox v. Jerome and Others—The Water-Gas Libel Case.

This was an action brought by Mr. Samson Fox, the Managing Director of the Leeds Forge Company, Limited, against Mr. Jerome K. Jerome, the Editor of "To-Day," Mr. Dunckerley, the publisher, and Messrs. Wyman and Sons, Limited, printers of the paper, in which the plaintiff sought to recover damages for a series of alleged libels published therein. The libels complained of appeared in the months of May, June, July, and August, 1894, and in January, 1896; and they charged Mr. Fox with having induced the public to subscribe the capital of the Leeds Forge Company, Limited, by gross and deliberate misrepresentations as to the value of the patents and processes sold. The defendants also charged the plaintiff with giving to the Royal College of Music £46,000 which he had drawn from the pockets of the public by his misrepresentations.

Sir Edward Clarke, Q.C., M.P., the Right Hon. H. H. Asquith, Q.C., M.P., Mr. H. F. Boyd, Q.C., and Mr. Colefax appeared for the plaintiff; Sir Frank Lockwood, Q.C., M.P., Mr. Bigham, Q.C., and Mr. Danckwerts represented the defendants.

Sir E. Clarke, in opening the case, said Mr. Samson Fox claimed damages for a series of persistent and malignant libels. He did not suggest that Mr. Jerome had any malignant feeling towards the plaintiff; but it was possible—indeed, likely—that before they came to the end of the case he should be able to discover who were the persons who had made Mr. Jerome their instrument, and had endeavoured to satisfy private animosity against the plaintiff by using the columns of "To-Day" for circulating the libels against him. Mr. Fox was born in 1838; and his name had become very widely known as a successful inventor of some of the most valuable mechanical and engineering processes the world had known. He had begun life in very humble fashion. As a boy of ten he earned half-a-crown a week at a factory; at sixteen he became a working engineer; and so advanced step by step, altering his position in life. In 1865, he commenced on his own account as a tool maker in Leeds; and until 1873 he carried on the business. In that year, he started the Leeds Forge Company, Limited, with a capital of £60,000; and that Company took over the tool business. In 1874, Mr. Fox made one of the greatest inventions of the century. He applied corrugated metal to boiler-tubes, which enormously increased the existing power of the tubes. It had produced a revolution in the boiler trade and the working of the boilers; and 180 vessels of Her Majesty's Navy had these boilers fitted. In 1886, he made another great invention of pressed steel plates for the platforms of railway carriages. Thus by 1887 Mr. Fox became very wealthy; and as he was then fifty years of age, he was desirous of doing, out of his fortune, something in the way of service to the public. He was always fond of music; and he mentioned the matter to his friend Sir George Grove, who suggested that he should give money for a building for the Royal College of Music. He gave £30,000; but the architect considering this too small a sum for the proposed building, it was increased to £46,000. That gift had been made by Mr. Jerome the pretext for his attack on the plaintiff. In 1888, the Leeds Forge was going on with great work; and Mr. Fox became much interested in water gas—not for the first time in that year, because water gas had been used in the Leeds Forge for a considerable period, and he had formed a very high opinion of its commercial value. His opinion was derived from experience and personal judgment of mechanical and industrial matters of every kind. The cost of production of water gas was very trifling indeed. The gas was not a good illuminant; but it produced very great heat—higher than any known to science practical for useful purposes. In 1888, Mr. Fox was instrumental in forming a Water-Gas Syndicate, and in the prospectus he claimed to have acquired patents of value; but the defendants charged him with making these statements untruly, well knowing that the patents were of no value at all, and that the industrial process was of no value to work. In an action which was tried last year,† witness after witness proved their value; and the opponents surrendered at discretion. Water gas had not been of commercial advantage for illumination, partly because of another remarkable invention; but by the application of its intense heat for welding purposes it was of enormous value. The Leeds Forge Company was in existence now, and was a prosperous concern after a period of difficulty and depression. For a year-and-a-half or two years, it had been doing a good commercial business; and water gas had been used for welding steel with a result which, according to scientific authorities, could not have been produced in any other way. Sir Henry Roscoe, his assistant, and Professor Lewes would speak to this and other scientific matters involved in the case; and he doubted very much whether defendants' Counsel would think it expedient to carry very far the suggestion hostile to Mr. Fox which had been put forward. The libels complained of said that the statements in the Leeds Forge Company's prospectus were fraudulent, and those in the prospectus of the British Water-Gas Syndicate were untrue. The real question for the jury to try was whether or not Mr. Fox, in putting forward these statements, was acting the part of an honest man.

Mr. *Samson Fox* was then examined by Mr. Asquith. He said he was the Managing-Director of the Leeds Forge Company, and the late President of the British Water-Gas Syndicate. He was a member of the Institution of Civil Engineers, and he had devoted himself to improving tools and machinery. He started the old Leeds Forge as a limited liability company in 1874. In 1877 he invented and patented corrugated iron boiler-tubes; and the effect was to make the corrugated tube from four to ten times stronger than the plain one. In 1886, he invented the Fox pressed steel plates, which had come into use all over the world. In 1888, when he entered into an agreement with the Prince of Wales to give the money to the Royal College of Music, he had no idea of the New Leeds Forge Company or of the water-gas companies. At that time he had an income of £10,000 a year. It was in 1882 that he first considered water gas as a fuel. He had relations with Messrs. Schultz and Co., of Essen, and they used water gas in making the Fox corrugated tubes. They told him that it was economical to use water gas for the purpose. He had used coal gas, but it had not sufficient power to make a solid weld; and he found that water gas, by reason of its intense heat, possessed greater welding capacity. He visited the Essen works in 1886, and was struck with the cost of the manufacture of the tubes, which was about one-half that at Leeds. The welding at Essen was so good that there was very little to be done over again; whereas at Leeds 29 furnaces had to be kept going for mending alone. He opened negotiations with Mr. Massenez, the Chairman of the European Water-Gas Company, for getting a licence to use water gas at the Leeds Forge; and he obtained one in September, 1887. In 1888, he purchased the patents for the United Kingdom. The British Water-Gas Syndicate was formed in March, 1887; and the members of the Syndicate elected to take shares in the Company, on its formation, instead of cash.

Thursday, April 1.

Mr. *Samson Fox*, further examined by Mr. Asquith, said he had never sold shares on the Stock Exchange. When he had executed transfers, the shares went to friends of his; and he sold them for exactly what he gave for them. He had never made one penny profit in his dealings in shares in the Water-Gas Companies. He was not a Director of the Yorkshire Water-Gas Company, which was the first subsidiary Company, or of the Notts and Derby Water-Gas Company, but he joined the Board of the North British Water-Gas Syndicate. He did not receive, nor did he pay, any moneys in connection with the forming and floating of these Companies. The purchase-money was paid to the parent Company. Of the three subsidiary undertakings, he was only a shareholder in the North British Company. The Notts and Derby Company never started business, because they would not take up the licences that had been agreed on; and when proceedings were taken to compel them to do so, the Company went into voluntary liquidation. The Yorkshire and North British Companies started business, and erected plant in various places. The Stewart and Clydesdale Company—probably the biggest boiler-tube makers in the world—had water-gas plant put up, which worked successfully; and they ordered more. The Lancaster Waggon-Works also had plant in connection with the making of wheels and platforms for railway carriages. Messrs. Moss Bros. of Eastwood, used the plant for singeing knots off cloth, &c. After mentioning other places where the plant was used, witness stated that in 1889 there were some fatal accidents at the Leeds Forge, owing to the inodorous nature of water gas. Two men were suffocated. Then a man was killed by an explosion at Hull; and there were one or two explosions at Windsor. In consequence of all this, the estimation in which the gas was held by the public went down. They were now working furnaces at the Leeds Forge with water gas night and day, and with successful results. There was no truth in the assertions in the libels that he "debauched officials by bribery." In the plea of justification, it was stated that by debauching officials by bribery was meant the payment of extravagant salaries; but up to 1891, the Chief Engineer was only receiving £500, the Secretary between £300 and £400, and the Commercial Manager £250 a year In 1892, Mr. Worth was appointed Managing Director at a salary of £800 per annum; but witness gave up £500 a year as Chairman to provide a portion of that. The salaries so paid were not in excess of the services rendered. He believed the statement made in the prospectus of the new Leeds Forge Company in regard to the value of the patents was true.

Mr. Asquith: It is suggested in the libels that the Leeds Forge Company as well as the Water-Gas Companies is a bogus affair. Give us the full particulars of the present state of the Leeds Forge Company.

Witness produced the 1896 balance-sheet, which showed a credit of £39,538, of which £30,000 was proposed to be appropriated to the reserve account for depreciation, £750 for Directors' fees, and £1091 to be carried forward. In that year, the business had been relatively unprofitable; but in no year had there been a loss. They had always paid the interest on the debentures. In 1891, 1892, 1893, and 1894, the whole branch of the industry suffered in common with the Leeds Forge Company. In the middle of 1895, matters assumed a brighter aspect. Mr. Scudder, in his report made before he became Scientific Adviser to the Syndicate in 1891, said that water gas as used at the Leeds Forge was a valuable agent, and could be produced at from 4d. to 6d. per 1000 cubic feet; also that it had a field open to it as an illuminant, and possessed important advantages. Sir Henry Roscoe and Mr. Scudder went to the Continent together in 1891, and made a report, a summary of which was issued to the shareholders.

* See "Journal," Vol. LXV., p. 225; and Vol. LXVI., p. 42.
† *Ibid.*, Vol. LXVII., p. 519.

Mr. Asquith: Is it true, as stated in the libels, that water gas is not used at the Leeds Forge for steel melting, except on show occasions?

Witness: No; it is constantly used, night and day. It has added to it gas from Wilson producers and Siemens generators, because producer gas gives more heat; but the water gas is the calorific agent.

In your judgment, when you took part in the formation of the British Water-Gas Syndicate, were these patents valuable and valid?—Yes; and I have seen nothing to alter my opinion.

Cross-examined by Sir Frank Lockwood: The Leeds Forge Company had a capital of £600,000; and they paid the vendors £564,000. He was the largest shareholder in the old Leeds Forge Company. The British Water-Gas Syndicate had a capital of £300,000, paid the vendors £217,000, and went into liquidation. They only paid one 5 per cent. dividend. The Yorkshire Water-Gas Company had a capital of £151,000, and went into liquidation without paying a dividend; and the North British Water-Gas Syndicate, with a capital of £306,000, did not pay a dividend.

Sir F. Lockwood: And so, however great a success commercially, in your estimation, water gas may be, the public have subscribed roughly £1,600,000, and there has only been one dividend of 5 per cent. in respect of one Company, and two dividends in respect of the Leeds Forge Company?

Witness: That sum represents the nominal, not the paid-up capital. The North British shareholders were liberated from a very large sum. The public subscribed £240,000 to the Leeds Forge Company, and a sum of £50,000 in fully-paid shares was given to me. About £190,000 was got from the public for the North British Company, and £60,000 for the Notts and Derby Company.

Witness's attention was called to his speech at the statutory meeting of the British Water-Gas Syndicate, on May 14, 1889, in which he said: "We have fixed concessions amounting to £201,000." He explained that these concessions consisted of the Glass Union agreeing to give them £100,000 in cash and £50 per set of apparatus for use at their works, and the rest was to come from the Lancashire Company. It was agreed to verbally; but the Glass Union broke the contract. They were not, however, sued in respect of the breach. The Lancashire Company was not carried through, but he believed the Glass Union was. He could not point out to the jury any portion of the speech which told the shareholders that the Companies did not exist. Witness was then questioned on the entries in his bank-book, and asked whether the sums paid in between the 28th of March and 1st of June, 1889, amounting to £237,181, did not come from the public subscriptions to the Leeds Forge Company; and he replied that he should think some of the money did come from public subscriptions. In further cross-examination, witness said he had never threatened persons with actions for infringement of his patents for corrugated flues; and, with the exception of the Farnley Iron Company, no corrugated flues had, to his knowledge, been manufactured by anyone save the Leeds Forge Company. An account of what was done at the Leeds Forge was taken before the prospectus was issued; and this account formed the ground of the statement that the introduction of water gas, of which the Company had the monopoly in the United Kingdom, for welding tubes, effected a saving to the Company of £10,000 a year. The prospectus represented that he was selling to the new Company the monopoly of the processes for the manufacture of corrugated tubes. The principal patent had between seven and eight years to run from 1889. That patent was for the rolling-mill. There were a very large number of patents in connection with the base patent, which was taken out in 1877, and therefore expired in 1891. He received £6 a share bonus on the reconstruction of the Company; and that would come to £66,000. He was paid royalties up to the time he gave up his patents for shares in the old Company; but when he so capitalized them he was not contemplating the idea of reconstruction. He received £50,000 in Leeds Forge fully-paid shares for his patents in 1887.

Friday, April 2.

Mr. *Fox*, in further cross-examination by Sir F. Lockwood, stated that, when he told Mr. Craven to value the patent machinery for the formation of the new Leeds Forge Company, he said he was to do so on the basis of the patents. He did not give Mr. Craven a list of the dates when the patents would run out; but he was sure the valuer had the specifications placed before him. Asked if he could give any idea of the actual amount which had been expended on plant and machinery for the old Leeds Forge Company, witness replied that he could not give even an approximate idea, but the balance-sheets would show it.

Sir F. Lockwood: The works, plant, and machinery were valued by Mr. Craven at the sum of £529,000, and the purchase price was fixed at £564,000. By what process did £529,000 become £564,000?

Witness: I cannot tell you.

Who was responsible for it?—Mr. John Scott, the Chairman of the Company, who always took the lead in the management of the accountancy department of the business.

He is just the man I should like to see. Will he be called?—I cannot say.

Would not the most material point to give Mr. Craven in valuing the patent machinery "as a monopoly" be some information as to the duration of the patents?—I do not know.

As a practical man, if you were valuing a patent machine as a monopoly, would you take into consideration the length of time the patents had to run?—I would give more for a patent that has been developed and has become established in the public mind than for a first or second year patent.

In further cross-examination, witness stated that he could not give the value of the machinery which had been added between Dec. 31, 1887, and the date of Mr. Craven's report, Dec. 8, 1888; but they were spending money very fast at that time. What Mr. Craven valued at £529,000 appeared in the balance-sheet up to the end of 1887 at £285,822. But they were then a small private concern, and they wrote down very considerably each year; and this was why the assets, when they came to be valued, appeared at so much more than they did in their books.

Sir F. Lockwood: In your private capacity, you had written yourself down; but in your public capacity, you thought you would blow yourself out a bit.

Witness: No; £12,000 was written off the value of the patents in 1887; but I cannot give any reason why the depreciation should not continue in 1888. Mr. Scott was responsible for writing off the £12,000.

But you were the Managing Director, and you saw the balance-sheet; and if it had been an improper amount, you would have altered it?—It would have been of no use.

Oh! I see. Scott again, a determined fellow, Scott. A Scott by name and a Scot by nature. Will you explain how the £285,000 at the end of 1887 became £564,000 one year later?—The value was practically the same the year before. You might put your own valuation on a thing you were not going to sell. A good many concerns were wiped down in this way.

In further cross-examination, witness said that Mr. Hardcastle was the Auditor in 1887, and he was about leaving at the time of the reconstruction. Mr. John Gordon, jun., audited for the purposes of reconstruction; but Hardcastle refused to join in the audit, and sent an auditor of his own. Mr. Gordon was assisted by Mr. Lovering, of London. Mr. Cottam introduced Lovering; and the reason Hardcastle refused to act was that he had a dispute with Cottam. Witness's attention was then called to the patents which anticipated his corrugated flue patents.

Baron Pollock: Was your patent opposed at all?

Witness: No; never.

Sir E. Clarke here pointed out that the only patents referred to in the plea of justification were the water-gas patents. He would not, however, object to his friend going into this matter if he supplied him with the patents he alleged were anticipations.

His Lordship said he thought it rather hard that the plaintiff should be put to the proof of his patents. Anyone who knew the nature of a patent action knew what this involved.

Sir F. Lockwood contended that his plea applied to this patent. The prospectus stated that the corrugated flue patents were one of the monopolies belonging to the Leeds Forge Company; and the defendants said these statements were false. He would give a list of the alleged anticipations.

Witness said some of his patents were quite young. He had taken out about forty of them. As to the moneys advanced by the employees of the Leeds Forge Company, the vendor's shares were subject to a condition that they could not be sold until a special settlement had been obtained. Those who advanced money knew they were to have vendor's shares. The ordinary shares in the British Water-Gas Syndicate, £3 paid, were at £21 premium on May 4; and a special settlement of the vendor's shares was obtained on the 24th of that month. He could not tell whether any of the subscribers got their money back, with the exception of Bagshaw, witness's son-in-law, to whom he wished to make a present for some extra work he had done. Between £38,000 and £39,000 was paid for the water-gas patents; and of this sum the workmen contributed £3500. On his return from America, his workmen joined together, and gave him a banquet on the 11th of July, 1888.

At the banquet I notice the Leeds Forge Band discoursed a selection of music; and among the pieces they played was the very appropriately named waltz by Strauss—"Promotionen." (Loud laughter). Did you at that time contemplate the reconstruction of the old Leeds Forge into the new Company?

Witness: No; I had at that time paid a deposit for the purchase of the water-gas patents from the European Water-Gas Company.

You were the sole vendor of the British Water-Gas Syndicate, and you were to be paid in cash £159,000 for what you gave £39,000. Do you consider that a fair and honest transaction?—It was a bargain honestly carried out.

You had got £60,000 out of the Leeds Forge reconstruction, and now you get over £150,000 from the water gas. Why not be content with a larger amount of share capital, and less hard cash?—A man, at any rate, can be allowed to say what he would like for what he is going to sell. I knew that the patents were cheap. There was one district in New York which paid £60,000 to have its streets lighted with water gas.

Sir F. Lockwood remarked that he did not care to inquire what was the condition of people in New York.

In further cross-examination, witness said he believed the patents were worth more than £150,000, and that they would give the Syndicate a million pounds. A Liverpool agent, inquired into the value of the patents for him in August, 1888. In Essen, the water gas worked very satisfactorily. It was used for welding in 1889; and in that year 200,000 tons of corrugated flues were so welded. At Hörder, it was used in 1889 for re-heating and other purposes; and it was not true that it had been abandoned at Witkowitz. Water gas had been a commercial success where it had been intelligently applied to the right sort of work. Asked if he could give the name of any man besides himself who had made £50,000 out of it, he mentioned Mr. Andrew Stewart, of Glasgow, the largest tube maker in this country. The Leeds Forge had also, he said, made a large sum. Witness's attention was then again drawn to the speech he made at the statutory meeting of the British Water-Gas Syndicate, in which he said that the Company had entered into contracts, on which substantial deposits had been paid, amounting in the aggregate to £1,000,000 sterling. He now said that, though there was no untruth in that speech, he would not make it over again. The deposits consisted of a cheque for £1000 from Cottam, who undertook to promote the Companies to take over the contracts. This was the only justification for his speech. He did not take shares in the Yorkshire Water-Gas Company. In May, 1889, the Directors of the Yorkshire Company bought £20,000 worth of shares of the parent Syndicate; but this was not done for the purpose of bolstering up the market for the parent shares. The Directors of the Yorkshire Company who proposed the purchase were holders of Yorkshire shares; and they wanted the purchase of British shares to be carried through, so that the parent Syndicate should do the same, and buy the Yorkshire shares. He stopped the purchase of the Yorkshire shares after four days.

The further hearing of the case was adjourned till Monday (yesterday).

The Incandescent Gas-Light Company's Patents.

In the Chancery Division of the High Court of Justice last Friday, Mr. Justice Romer had before him a motion to commit one Dosteel, who carries on business in the Gray's Inn Road, for breach of an injunction

granted against him to restrain the infringement of the patents of the Incandescent Gas-Light Company, Limited. There was no appearance for the defendant; and, after affidavits had been read proving the purchase and analysis of infringing mantles, his Lordship made the order for committal. On the following day, a motion came before him as a short cause, in default of appearance by the defendant, one Hendrick. The order asked was in the same form as had been made in so many previous cases—viz., an injunction, an inquiry as to damages, an order for the delivery up of infringing mantles, and costs up to judgment; the costs of the inquiry to be reserved, with liberty to apply. His Lordship made the order. Similar orders were made against the following defendants: Rosenthal, Pinner, North London Incandescent Light Company, the Gas-Light Incandescent Company "Mercur," the Sunbeam Light Company, the Britannia Incandescent Light Company, the Leader Incandescent Light Company, the Eldorado Incandescent Gas-Light Company, the International Lighting Company, Mulley, the Comet Incandescent Lighting Company, the Reliance Incandescent Light Company, the Luna Incandescent Company, and Burnie. On the same day, Mr. Justice Kekewich made a similar order against one Metzler.

Tampering with Gas Service-Pipes at St. Helens.

At the St. Helens Petty Sessions yesterday week, Richard Kerr, a publican, was charged with fraudulently introducing a pipe into his gas service for the purpose of consuming gas without passing it through the Corporation meter, and also with disconnecting the meter from the service-pipes. The Town Clerk (Mr. W. J. Jeeves) stated that the two summonses were practically the same. Defendant was the tenant of a beerhouse, at which, on March 15, a Gas Inspector named Whittle called in order to examine a meter. A servant girl admitted him to the cellar where the meter was fixed. He found that the pipes to and from the meter had been disconnected, and that a piece of india-rubber tubing had been introduced so that gas passed from the Corporation main to defendant's burners without being registered. Whittle called Kerr's attention to the irregularities; and Kerr asked him not to report it, as he was in a very poor way, and had a child on the point of death. Whittle returned a little later with Mr. S. Glover, the Gas Engineer; and, in the meantime, the india-rubber tube had been taken away, but there was clear evidence that Kerr had tampered with the pipes and meter. But for the accident of the servant being the only person in the house when the Inspector called, the alteration might not have been discovered. A great deal depended on the honesty of the consumers; and in this case there was nothing to mitigate the seriousness of the offence. Mr. Garner, for defendant, said he was prepared to plead guilty to both offences but for the fact that the word "fraudulently" had been inserted in the first charge. There might be *primâ facie* evidence of fraud; but it was not conclusive. The explanation of it was that on the Saturday night the supply of gas was defective, and the illuminating power very poor; and, in order to improve it, defendant disconnected the pipes and allowed the gas to pass from the main to the burners. He admitted doing it, but intended reporting the matter to the Gas Engineer on the Monday morning. Owing to having been up all night with his sick child, he delayed going to the gas-works; and meantime the Inspector called. The Bench showed their opinion in regard to the matter by inflicting a fine of £3 and costs on the charge of introducing the pipe. The other summons was withdrawn.

Abstracting Water from a Drinking-Trough for the Supply of a Traction-Engine.

At the Bristol Police Court on Monday last week, Lewis Roberts was summoned, at the instance of the Bristol Water-Works Company, for wrongfully taking water from a drinking-trough, supplied by the Company for the use of the Bristol Sanitary Authority. Defendant did not appear. Mr. C. J. C. Prichard, who appeared for the prosecutors, explained to the Magistrates that at Jacob's Wells there was a drinking-trough and fountain, which were supplied with water by the Company by arrangement with the Sanitary Authority, at a very low rate, but not for trade purposes. The driver of a traction-engine had been in the habit of supplying the tank of the engine from the trough; and it took 300 gallons to fill it. Such a practice was never contemplated, and was against the spirit of the Act of Parliament. If the Company had to supply water for this engine, they would do so at trade rates, or under special agreement. The summons was taken out under the Water-Works Clauses Act, and the maximum penalty was £5. It would be proved that defendant on March 16, drew up his engine, and took the water from the trough—emptying it entirely. This, he (Mr. Prichard) was sorry to say, was not the first, second, or third time such a thing had been done. The Company had another case in which the police had not been able to serve the summons in regard to the same engine, but another man using it. The section of the Act applying to the case was very plain. A police constable deposed that, on the evening of March 16, he was by Jacob's Wells, and saw the engine standing by the trough. It was taking in water from the trough by means of an india-rubber tube. The men in charge, as soon as they saw witness walking in the direction of the engine, removed the tube from the trough, whereupon the water gushed out. He asked the defendant if he was the driver of the engine; and he said he was, but it belonged to his brother. He was fined 20s. and costs.

West Gloucestershire Water Company.—By the half-yearly report of this Company, it is seen that the business continues to progress, and that extensions of works and of the area of supply are still being undertaken. The accounts for the half year show that, after paying all working expenses and interest on debenture stock, a net profit of £988 has been earned in the half year; and this, together with £27 brought forward, makes a total of £1015 to the credit of the revenue account. The Directors also report upon certain official changes, which are noticed in the "Personal" paragraphs in the present issue. At the ordinary meeting of the shareholders last Saturday week, the report was adopted, and a dividend at the rate of 2½ per cent. per annum was declared.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Thursday, at the Cannon Street Hotel—Mr. John Blacket Gill in the chair.

The Secretary (Mr. H. D. Ellis) read the notice convening the meeting; and the Directors' report and the statement of accounts, as given in the "Journal" last week, were taken as read.

The Chairman, in moving the adoption of the report and accounts, said that, when he last had the pleasure of addressing the proprietors, he was rather taken to task for expressing too gloomy a view of the Company's position. Almost at that time, or very shortly afterwards, the wave of prosperity of which they heard in other parts of the country found its way to the East-end of London; and he was glad to think that his perhaps somewhat gloomy views had not been entirely carried out. He thought they might honestly congratulate themselves upon the accounts the Directors had presented—more especially as to one feature, which was the very large gain in the gas-rental. They had had an increase of upwards of 7 per cent., which was something they had not been accustomed to for many years past. Of course, there was a reverse to this, as to most, pictures. They found their residuals were not so good as they could wish. He believed they were better off in this respect than some companies; but still the receipts under this head were not as good as they hoped for. It would be seen that, in comparison with the corresponding period of last year, they had spent £2000 more for coal, on account of the increase in the consumption of gas; and the carbonizing wages had advanced by £800. Rents, rates, and taxes had gone up another £1000. He was pleased to say the bad debts were £400 less, which spoke volumes for the improvement of their business. On the other side, they had £9457 more for gas-rental; and £700 more for coin-meters and fittings. For coke, they received £2480 less; for tar, £312 less; and for sulphate of ammonia, £870 less. The residuals were, of course, beyond the control of the Directors; but sulphate had now reached such a low limit, that it was hoped the worst had been seen. To pay the dividend of 13½ and 10½ per cent., they required £45,787. Then they proposed, as in previous half years, to put £890, which was ½ per cent., to the reserve fund; so that, after paying debenture interest and interest on loan, they were altogether about £3258 short. This they were able to take out of the reserve of undivided profits, and then carry forward about £5000 to the next account. The Engineer (Mr. H. E. Jones) had made an interesting report upon their works; and there was one paragraph in it which he (the Chairman) thought would be especially interesting to the proprietors. It was this: "The increase in the sale of gas is most satisfactory. Of the total 75,837,000 cubic feet, 16,758,400 feet is contributed by the increase of coin-meters; the rest, by the revival in trade throughout the district, which is shown in every form through our rental and collection." The number of coin meters had risen in the half year by 1315; and up to the previous week, they had 5616 fixed in the district. He supposed the time was not far distant when no workman's house would be complete unless it had a coin-meter, which would not only be an immense boon for the working man, but a great advantage for the Company in the future. They had also increased the number of gas-stoves to nearly 7000. Electricity had reared its head again in their midst; and he was told that two or three of the parishes were thinking of adopting it. But he thought, with gas at 2s. 6d. per 1000 cubic feet, the Company had not much to fear from electricity in their quarter. The West-end was where it flourished, and would probably continue to do so; but he did not think it would in the East-end. The Directors had experienced considerable disappointment in connection with the Poplar works. They had long been unable to get steamers alongside the wharf, on account of the new bridge over the river; and when at length the bridge was finished, they found it was not big enough for steamers. They were making arrangements for a new vessel, which he hoped would, before many months, be running to the works; and this would effect a considerable saving in the cost of coal. During the last half year, and indeed for some time past, they had been expending a good deal of money on new works. At Poplar, they were building the foundations for new retorts; and they had put down a coke tramway, which was worked by an engine, and was very convenient. At Stepney, they had put up a gantry, by which they were enabled to unload the coals very much better than under the former arrangement. At Wapping, they had built new retort-beds and a purifier-house, and put in a new scrubber. Several lengths of new mains had also been laid in the district during the past six months. This half year they would want more money for coin-meter services. They were also about starting a water-gas plant at Poplar. As the proprietors were aware, for several years past they had been enriching the gas by petroleum vapour. But at length the Directors had come to the conclusion that it would be more convenient to have a water-gas plant; and no doubt, from the reports they had from all quarters as to its usefulness, they would find it very convenient next winter. Residuals, they believed, were as low as they possibly could be; and he hoped, before the proprietors met again, there would be an improvement in this direction.

The Deputy-Chairman (Mr. W. G. Bradshaw) seconded the motion, which was unanimously carried.

A resolution was then passed, declaring dividends at the rates of 13½ per cent. per annum on the old stock, and of 10½ per cent. per annum on the new stock, both less income-tax, and carrying to the reserve fund the difference between the declared rates and the authorized rates of 13¾ and 10¾ per cent.

The Secretary next read two resolutions referring to the raising of additional capital. The first authorized the Directors, in exercise of the powers conferred by the Commercial Gas Act of 1875, to raise £71,500 by the issue of £35,750 of new ordinary stock, and £35,750 of debenture stock—the latter to bear interest at the rate of 4½ per cent. per annum. It also provided that the new stock and debenture stock should be offered at par among the respective proprietors of ordinary, new, and preference stocks, in rateable proportion to the amount of stock appearing by the register of the Company to be held by them respectively at the dates of such offers. The second resolution empowered the Directors to dispose of any stock not accepted within the time limited, or any in respect of

which default was made in the payment of the amount due. It also provided that the Directors might, on such grounds as they deemed sufficient, extend the time for acceptance or payment.

The CHAIRMAN, in moving the adoption of the resolutions, said he had no doubt many of the proprietors had noticed that for some time past their capital account had been considerably overdrawn, and that they had also indulged in the luxury of a loan. The Board had very good reasons for not calling up capital at that time, because, as he had said, up to six months ago, they were looking in vain for an increase in their business. Now it had come; and the Directors thought a good time had arrived when they could ask the proprietors for a little more capital. He believed they might take credit to themselves for not having called up capital recklessly; and, indeed, they had stayed their hand when possibly, under other circumstances, they would have asked for fresh capital. In 1875, the Company obtained the Act under which they now worked. As those present were aware, it gave the Directors the power to allot to the proprietors new stock and debenture stock at par. He believed no other company in the kingdom had this power; and he remembered that in 1875 (for he happened to be on the Board then himself) they thought they had scored a great triumph. In those times, with gas at 3s. 9d. per 1000 cubic feet, and plenty of good business going on, no doubt this power was a great boon and advantage to them. But *tempora mutantur*. They were told by some—by those whose opinion they always held in respect—that this power was positively a detriment to the Company; and they ought to apply to the House of Commons to divide their stocks, and, if necessary, give up the boon (and many of them thought it was a boon) which they possessed. Their Secretary prepared a most able statement as to how they should proceed if they went to the House; and the Board considered the matter most carefully in all its branches. He was glad to say they came to the conclusion that they had better "bear the ills we have, than fly to others that we know not of." The Directors were not at all anxious to enter the portals of Parliament; and Parliament would be certain, if they got the Company within those portals, to shear them of some of their advantages. It might, of course, be pointed out that the South Metropolitan Gas Company had got what they desired. But then there was this important matter to consider—the South Metropolitan Company had nothing to lose, but everything to gain. The day would possibly come when the Commercial Company, exhausted of their capital, would have to apply to Parliament; and then would be the time to take what Parliament chose to impose. He thought that for the present they had better go on as they were. Another thing that struck him was this—that, at a large sale of their stock, special attention was drawn to the fact that the Company possessed this power; and he considered the proprietors might rightly complain if the Board sacrificed their rights without their sanction. The Board had determined to let things remain as they were; and therefore they had the privilege of offering the proprietors the new stock at par. Of course, they were handicapped to a certain extent, because other companies obtained their capital at between 3 and 4 per cent.; whereas the Commercial had to pay something like 7 per cent. Their Engineer, however, was a man of fertile resource; and they must look to him to earn the dividend for them. Some of the proprietors might say: "If you do not earn your dividend, you can raise the price of gas." He (the Chairman) hoped they would be able to pay the dividend without taking such a step as that. They had a fair reserve fund to fall back upon; and he saw nothing to alarm them on that score. To raise the price was a thing they did not wish to even dream of. They had the greatest confidence that the best foundation on which to build their prosperity was cheapness. Nothing would more ensure the success of a Company like theirs than cheapness, and appealing, by cheapness, to the humblest of their consumers. He added that the date had not been fixed for the issue of the stock; but ample notice would be given. The amount of each class of stock to be issued would work out to 5 per cent. of what the proprietors held. Before, however, the stock could be allotted, they would have to obtain a certificate from the Board of Trade; but he did not think there was much doubt as to getting it.

The DEPUTY-CHAIRMAN seconded the motion, which was at once agreed to.

The retiring Directors and Auditors were re-elected.

Mr. H. FINLAY proposed a vote of thanks to the Chairman and the Directors. He remarked that, as a shareholder of 40 years' standing, and who some time since spent eight years in the service of the Company, he was strongly convinced of the future prosperity of the concern.

Mr. CECIL seconded the proposal, which was unanimously passed.

The CHAIRMAN briefly responded; and then moved a vote of thanks to the Engineer, Secretary, and officials for their able attention to the affairs of the Company. He remarked that the increase in the consumption of gas, the difficulty of getting coal, the thickness of the atmosphere, and the dread of the people who were constantly testing the gas, had combined to make the work of the past half year very arduous for their Chief Engineer and the Engineers at the three stations; but they had surmounted all difficulties. He also eulogized the work of the Secretary; and then mentioned that Mr. Nash, who had been in the service of the Company 36 years, and to whom the Board had given a pension, had died after only fourteen months' enjoyment of his retirement. Taking this into consideration, the Board would not, he remarked, lose sight of the widow for a year or two.

The DEPUTY-CHAIRMAN seconded the motion, which was heartily adopted.

The ENGINEER, in reply, first of all spoke of the kindly relations which existed between the Board and the officers. Proceeding, he said that the increase in consumption in the past half year had been spoken of by the Deputy-Chairman as a record one for the Company. Accustomed as he (Mr. Jones) was to dealing with the figures of a great many gas companies with considerable increases—in one case 32 per cent., and in another 17 per cent.—the proprietors might well imagine that he rather pricked up his ears on hearing that their own was a "record" increase; and, on looking at a table showing the statistics of the Company for some years past, he was reminded that it was so. He saw gentlemen present who would know how, first of all, the doing away of the great sugar industry had affected the east of London. The French, with their sugar bounties, had attracted an enormous business in which the East-end was vitally interested. Then the increase in the size of ships had taken the shipping (excepting small vessels) out of their district. Formerly they were the dock-supplying Gas Company in London; but the business had gone away from them, and it had carried with it those who catered for the ships. The great docks which were once a source of consolation to him to look at, were now more or less waste places. The London County Council had also, very properly, swept away certain places which teemed with life, industry, and flaming gas-jets. Then, again, residences in such parts as Bow Road and Victoria Park had been abandoned; and the people had gone away to the country. These things accounted for the fact that 7 per cent. (which was not at all an out-of-the-way increase for a gas company) was a record increase for them. The Chairman had stated that two or three of the parishes were thinking of adopting the electric light; but he (Mr. Jones) wished to put this in another way. The authorities in these parishes were invested with powers for electric lighting; but so little faith had they in the exercise of those powers, that they were negotiating for the transference of them to an enterprising company, who had lost money all over the country, and hoped to recoup themselves in the East of London. The Gas Company were giving exhibitions of superior lighting by incandescent burners; and wherever they had put them up, having overcome the difficulty of vibration, they were giving great satisfaction. The difficulties of the staff in connection with the ordinary work were greatly increased by the baser uses of science. No such rigorous testing of gas was practised in any of the large towns of the country as in London; and yet somebody was sending round a wheel-barrow photometer at all hours of the night. It was suggested that they were not playing the game fairly. To him (Mr. Jones) this was most odious; and he intended to fight against it. He was an honest man; and he meant to always faithfully serve the consumers, as he had done the shareholders.

The SECRETARY also responded, and this concluded the proceedings.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Wednesday—Mr. EDWARD FOTTRELL, J.P., in the chair.

The SECRETARY and GENERAL MANAGER (Mr. W. F. Cotton, J.P.) read the notice convening the meeting; and the report and accounts, which were summarized last week, were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said there was really very little for him to add to them. He must certainly congratulate the shareholders upon the fact that the sale of gas had not fallen off, but had rather increased. Unfortunately, however, there was a falling off in the receipts owing to the reduced price charged for gas during the half year. It was a great satisfaction to him to see that gas was not going out, notwithstanding all the attacks made on it by other illuminants; and he was perfectly satisfied that it would continue to be largely consumed. It would not be the fault of the Directors or the officers if it did not, as they took every possible means in their power to accommodate their customers and give them facilities for its use either for lighting or heating. In regard to residuals, he never recollected the market in such a bad state. Tar and sulphate of ammonia had both gone down. Some months since the latter produced from £20 to £21 per ton; but it had lately been selling as low as from £7 7s. to £7 12s. It was a pity that farmers had not a better knowledge of its properties, as it was one of the best fertilizers for forcing crops, especially turnips, mangolds, and potatoes. The Company would give every facility for its use. In Jersey, sulphate was largely employed, especially for early crops.

Mr. DRUMMOND seconded the motion, which was unanimously agreed to.

Dividends at the rate of 10½ and 7½ per cent. on the respective shares were next declared.

The retiring Directors and Auditor having been re-elected,

A vote of thanks was passed to the Chairman, the Secretary and General Manager, and staff for the efficient manner in which they had discharged the business of the Company during the past six months.

The CHAIRMAN having thanked the shareholders on his own behalf, said he could bear the fullest testimony to the services of the Secretary and Engineers.

Mr. COTTON, having acknowledged the vote, said, as regarded the question of residuals, he did not despair of the market rising. They had had coke, breeze, and tar at as low a price before; and as to sulphate of ammonia, he believed that would rise, for people were beginning to find out that there was not as much value in nitrate of soda as in sulphate. Therefore he looked confidently forward to the time when they would get a much better price.

The proceedings (which had been unusually brief) then terminated

TYNEMOUTH GAS COMPANY.

Emendations in the New Bill—The Past Year's Working.

At the Annual Meeting of the above Company yesterday week, the Chairman (Mr. J. B. Williamson) referred to the Bill which the Directors promoted in the present session of Parliament. He said that, the previous week, they had had the satisfaction of learning that the Bill would be reported to the House, which practically meant that it would now pass through the other stages without alteration. By both sides adopting this policy, costly law expenses had been saved, both to the Company and to the town. As the Bill now stood, the 10 per cent. stock and 7 per cent. shares were to be converted into one uniform consolidated ordinary stock, bearing a dividend of 5 per cent., the stock and shares bearing a proportionate value to each other in the conversion. Then they were empowered to raise additional capital to the extent of £75,000, bearing 5 per cent. dividend. They were also allowed to borrow a further sum of £25,000, which would give them a total new capital of £100,000—a sum ample for all possible requirements for the next fourteen or fifteen years. A new scale of voting by shareholders at meetings had been adopted in place of the cumbrous old method. The qualification of a Director had been increased from the holding of £100 nominal stock to £300. The Directors had agreed to insert a clause requiring them to supply gas of 16-candle power, tested by the No. 1 "London" argand burner. But as they had all along been giving gas considerably above this standard, the

illuminating power would not actually be altered. The insertion of a minimum pressure clause had also been decided upon; but this was likewise well within what they had been giving. They had consented to a reduction in the price to be charged for lighting the public lamps, both in the borough and Whitley district; and also to a clause allowing the Council to discontinue the use of any public lamps, providing not more than 50 were removed in one year. He thought the shareholders would agree that they had a very good and satisfactory Bill. Turning to the report and accounts for the past year (which were dealt with in last week's issue), the Chairman said there was only a slight increase in the make of gas over the previous year; this no doubt being due to the mild weather experienced up to Christmas. The increase on the year only represented 1½ per cent. For the past three months, however, the make had advanced nearly 10 per cent. Sulphate of ammonia had again been extremely disappointing in price. Last year it only gave them 1s. per ton of coal carbonized, against 1s. 3¾d. the previous year, and 1s. 9¼d. the year before. The receipts for tar were slightly better, yielding 1s. 2¼d. per ton of coal, against 1s. 0¼d. Coke, however, returned 3s. 6d. per ton as compared with 3s. 0¾d. last year. Taking the residuals as a whole, they did very well; yielding for each ton of coal used 5s. 8½d., against 5s. 5d. The report and accounts having been unanimously adopted, a dividend was declared of 5 per cent. on the original stock and of 3½ per cent. on the new share capital, which, with the interim payments, made 10 and 7 per cent. respectively.

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly General Assembly of the Proprietors was held at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., on Thursday last, under the presidency of Mr. GEORGE BANBURY.

The SECRETARY (Mr. I. A. Crookenden) having read the notice calling the meeting, the report of the Directors, summarized in the "JOURNAL" last week, was taken as read.

The CHAIRMAN remarked that, with the exception of the interruption to their constant supply last summer, owing to successive dry seasons, they had had a quiet and uneventful half year, and had consequently made satisfactory progress in their work, both as regarded the public and themselves. At their last meeting, he went so fully into all the circumstances of the temporary resort to the old intermittent service, that he need not go over this ground again; but he would revert to the important judgment given in the Hackney inquiry by the tribunal specially appointed by the Local Government Board to investigate the causes of the diminished supply. After lengthened inquiry, and when everything had been urged both for and against them by eminent Counsel, the Court decided that the responsibility for this want of storage—the cause of the failure—"could not justly be saddled upon the Company." It was necessary that this should be distinctly borne in mind, as, though the judgment was as clear as it could possibly be, and though they were absolved from blame throughout, attempts had been made for party purposes to minimize and, in fact, to ignore and repudiate these judicial findings. In a leading article a few days since, "The Times" thus touched upon these tactics: "It is depressing for friends of representative institutions to think that any body of men could calculate upon making political capital out of the shallow device of preventing the East London Water Company from obtaining the powers they sought for the construction of new reservoirs, and then denouncing them as the culpable authors of all the suffering which these reservoirs would have averted. It is more depressing still to find that an impudent perversion of facts, which could not deceive an intelligent child of ten, has, as a matter of fact, had an enormous success as an electioneering weapon." In the House of Commons recently, the President of the Local Government Board stated that "those who procured the rejection" of the Company's Bill in 1893, and not the Company, were responsible. Their increase in revenue for the past half year was more promising than usual, and came to £4477—making their total increase for the year £7322. He regretted that there had been some falling off in their meter-rents, which formed a substantive portion of their earnings. But they were to a large extent a trading company; and therefore their income from their meter supply must vary with the inevitable fluctuations in the state and prospects of business. They had done well as regarded realization of their revenue, as the arrears were £700 less, and their losses were £237 less, than in the corresponding period of 1895. They had during the half year laid on water to 2957 houses, of which five-sixths were outside the Metropolitan area. The average rate payable to them by these new comers was £1 4s. 0½d. per house. This was slightly better than of late; so that they were creeping up as regarded the type of tenements newly built. Considerable misapprehension seemed to exist as to the charges made by the Company; and it had been urged that they were comparatively higher than those of the West-End Companies. The crucial test was, however, what the individual consumer paid, and what the Company received per 1000 gallons. Their average charge was ¾d. per week per head over the entire district, including their best class of houses; and the price they received was just over 4d. per 1000 gallons, which was far and away less than that of the West Middlesex, the Chelsea, and the New River Companies, who obtained respectively about 8d., 9d., and 10d. per 1000 gallons. The East London Company also supplied many thousands of small tenements at a dead loss, so it seemed very doubtful whether any changes in the water administration would benefit their poorer consumers. In fact, as Mr. Sydney Holland very justly said, their would-be successors might adopt a system of "levelling up," which "might end in our having to pay half as much again for water as we East-Enders are now charged." Among the many haphazard accusations brought against them as regarded their charges, was that their revenue was constantly automatically increasing, without any outlay on their part, and without giving their customers any increased supply. This in their case was singularly inaccurate, as in the year 1820 their annual income per house was just under £1, whereas in 1896 it was only just over the £1; while their supply per house per day was now four times as much as it was in the former year. With regard to their expenditure, though there was a considerable decrease in their working expenses, they were still £11,162 over those of the half year ending Christmas, 1894, before the adverse days of frost and drought; but as this had been an open winter, and as they had their new reservoirs to safeguard them against any trouble in the autumn, they might confidently look for a welcome diminution under this head during the present year. The outlay attributable to last summer's drought came into the present accounts. It seemed hard to have had to pay several thousand pounds for what had been judicially decreed to be no fault of theirs; but the money was well spent in buying an extra daily quantity of water from the New River Company, in starting pumping-engines to temporarily increase their supply from the Thames, and in doing everything they could to mitigate the inconvenience caused to the poor and cisternless portion of their consumers, whose patience, fairness, and good temper throughout deserved their hearty thanks. Of course, those who had cisterns in their houses felt no inconvenience whatever. As to the purity of their water, both the Government Analyst and their own Analyst certified that the supply continued to be of excellent quality. In the report of Dr. Frankland, the Government Analyst, regarding freedom from organic impurity of the water of the various Companies, the East London came within a decimal point of the New River Company, whose supply, he believed, was generally allowed to be the purest in England. Again, according to the tabular statement of "oxygen required by organic matter," for the month of February last the East London Company stood first on the list. As to the bacterial improvement effected by their filtration, it came to 99·79, 99·70, and 99·89 per cent. for the three localities in which the analyses were made. This showed that their filtration plant must be in excellent working order. He frequently noticed that West Ham—a large, low-lying district supplied entirely by their Company—mostly exhibited a comparatively small number of deaths per 1000; but in the last return from the Registrar-General's monthly report of the 33 large representative towns in Great Britain, West Ham occupied the first place as regarded low rate of mortality. Their works for improving and enhancing their means of supply had progressed very satisfactorily. The new covered reservoirs at Buckhurst Hill and Hagger Lane were proving beneficial additions to their system; and he mentioned at their last meeting how valuable had been the additional storage of 220 million gallons furnished by the enlargement of the racecourse reservoir. Measures for increasing their capabilities and their pumping power were being actively carried out, so that during the dry months of the year they could make full use of their means and appliances. The main interest, however, of course centred in their two new reservoirs—the East and West Warwick. They would be glad to learn that the entire work upon the East Warwick had been completed; and at the present moment it contained 200 million gallons as addition to their storage, which now stood at 1000 million gallons. He was at the East Warwick reservoir a few days ago; and it was certainly a very fine sight, with its 46 acres of water area. There was not the slightest suspicion or trace of leakage in the 1¼ miles of bank. The West Warwick reservoir would be ready to receive its supply in May. He was glad to inform them that, owing to the energy, foresight, and resources of Messrs. Aird and Sons, the East Warwick reservoir had been completed ten months within the contract time; and its sister reservoir would be finished with six months to spare. Considerable difficulties had been experienced with respect to the West Warwick reservoir, owing to the very low level of the London clay in certain places. The further measures they had recently taken for the prevention of waste had produced good results, as proved by the returns of the volume of water weekly pumped into their ever-increasing area of supply. Their pressure had also been excellently maintained throughout the district, owing to improvements made in their system by Mr. Bryan. In fact, complaints had been made that the fittings recently fixed were in some instances unequal to the strain they had to bear. The Bills lately brought forward by the London County Council for the purchase of the Water Companies were practically the same as those rejected by the House last session; and they shared a similar fate—being thrown out on the second reading by a majority of two to one. From what could be generally deduced from the expressions of the Press and other sources, it certainly seemed unlikely that public opinion would add the words "deeply mourned" to the obituary notice of these eight measures. The hon. member for Poplar, when opening the case for the second reading of the Bills, stated that the London County Council were willing to give "a fair and just price" for the undertakings; and that he "was not asking the House to endorse the principle that the London County Council should be the future Water Authority throughout London." These amiable professions seemed, however, to have encountered a good deal of doubt and incredulity. After quoting from articles in "The Times" and the "Pall Mall Gazette" on this subject, he remarked that the Government proposed to appoint a small Royal Commission to consider and report upon the financial aspect of purchase, upon the administration of the outside areas, and upon various other matters. They also proposed to institute a permanent sort of Board of Control, before whom any water consumers might bring their grievances. It must, one would think, be apparent that the appointment of this small Royal Commission, composed of men of talent, special knowledge, and distinction, was the most statesmanlike and most businesslike way of settling these very difficult questions; but it was to be devoutly hoped that politics would be as absent from this Commission as they were from that of Lord Balfour of Burleigh. Politics upset Lord Cross's well-considered and amicable settlement of the London Water Question, which would now be heartily blessed both by the ratepayers and by the water consumers; politics caused the recent scarcity of water in East London; and politics had led to £130,000 of the ratepayers' and water shareholders' money having been spent in parliamentary and other litigation, which, as far as any beneficial results were concerned, might as well have been thrown into the Atlantic. As far as could be gathered from Mr. Chaplin's speech, the institution of a small Board to whom the consumers could apply for redress of grievances, would not be unwelcome to them, if it were composed of men of repute with open minds; for whenever they appeared before a tribunal of this description, they always came off well. When, however, speaking of the redress of consumers' grievances against the East London Company, they must remember that what with inferior fittings, heartless waste, illicit garden hose, and other contrivances, the "grievances" were rather the other way about. Their Bill for the construction of two more reservoirs at Chingford came on for second reading on Feb. 16. The only opposition

at this stage proceeded from a member who objected to the Company taking and absorbing into reservoirs land subject to common rights, which might be otherwise available for common recreation purposes. They managed to remove this opposition by agreeing that the Parliamentary Committee to which the Bill might be referred should take the whole matter into consideration, and decide what was fair and just as a set-off. Their Bill would after Easter come before the Committee, who might, he hoped, take the same view of its proposal as the President of the Local Government Board, who eulogized the scheme of additional storage proposed, and stated that when this was passed all anxiety on the score of possible scarcity in exceptional times of drought or frost should cease. They had, as usual, received energetic and efficient aid from their Engineer and Secretary; and he was happy to say that the comparatively quiet time of late had done much to restore Mr. Bryan's health. Mr. Crookenden looked after all their financial arrangements most carefully. The prospects of the Company were certainly brightening. Their business, their works, and more especially their available water, were all on the increase. During the past winter, they had had no long period of severe frost; and the rains in the Lea Valley had been sufficiently abundant to restore the depleted springs, and to send frequently 1000 million gallons a day to waste over the improved Lea Bridge weir. Two days' surplus flow at this rate would have been sufficient in volume to fill their present and proposed reservoirs; so that, as the Royal Commission pointed out, there was plenty of water in the Lea Valley for years to come, if only sufficient storage were provided. They might also confidently trust that, with the springs in the Lea Valley repleted, and with their additional reservoir power, they had everything snug and ship-shape against any deficient rainfall in the summer and autumn. They would doubtless have noticed with some satisfaction that their reserve fund, which was swept away by the frost of 1895, was now once more present with them, and apparently in good and promising condition. He concluded by moving the adoption of the report, and the payment of a dividend of 3½ per cent. (less income-tax) on the ordinary stock for the half year ended Christmas, 1896.

Mr. Herbert Dalton seconded the resolution.

Mr. Tendron said he thoroughly agreed with the remarks of the Chairman that politics should as far as possible be excluded; but however much they might desire that, politics would not be excluded either when an election to the County Council or to Parliament came about. Therefore the statement in the earlier part of the Chairman's speech as to the true position of the East London Water Company with reference to any deficiency of supply, was most important. It was not, however, important to the readers of "The Times," nor to those who kept themselves at all informed as to the actual state of things; but it was most important to the consumers of water in East London, and to readers of the "Daily Chronicle" and other papers of that class, if they would only honestly publish the Chairman's speech. If they controverted what the Chairman had said, there might be a fair and open field for them. Everything that the East London and the other Water Companies could do to educate the people on this question was greatly to the interest of the shareholders themselves, because the one hope for the Progressive members of the County Council was that as they could do nothing with the present Parliament—they must wait until the swing of the pendulum might bring in a Radical Government. He was very pleased at the manner in which the East London Company had always fought the battle of the Water Companies and had never failed to address themselves to the Press; and they had not been satisfied to be put down by evasive replies. He was sure they had noticed a letter in "The Times" of that day, in which a request was made that appeared most reasonable; and yet they might not be able to see the great difficulties in the way of the Company complying with it. This request was that poor people should not be obliged to depend on cisterns, and that occupants of the upper floors of high industrial dwellings should not have to descend to lower floors, and then carry their supply of water back to their own tenements.

The Chairman, in reply, said it was to be hoped that, as the Royal Commission referred to was to be very small, it would be composed of men of distinction, well acquainted with the matter in hand; and that there might be no more politics about the Commission than there were in the case of the last one. He thought that Mr. Barnett and Mr. Ingram were under a misapprehension. The question of cisterns was not a new one, but was fought over in the Hackney inquiry, when it was decided that cisterns were a necessity. There was no reason why they should get dirty; and there was a cistern to be had now which was automatically kept clean. As to Glasgow, this city had had an intermittent supply at times, like other places; and there were plenty of cisterns. With regard to the question of pressure in high dwellings, he was unaware of any complaint.

Mr. Bryan stated that they had certainly had no complaints lately on this matter.

The Chairman then put the resolution, which was carried unanimously; and the retiring Directors and Auditor were afterwards re-elected.

Dr. Chesshire observed that they had heard sufficient that morning to convince them that they were in a very good position. He found that in 1869 the revenue was £140,000, while it was now £300,000; and the number of supplies in the former year was 100,000, as compared with 188,000 now. All this proved that the Board, who had done the shareholders' work so well, must have had to experience considerable anxiety, and to undertake great labour, especially in view of the unfair opposition of the London County Council. One of the first resolutions passed by that body on their appointment was that they would buy up the Water Companies which they had not been able to do yet, though they had harassed the Directors in every possible way. He thought that the shareholders ought to recognize what the Board had done for them; and he proposed a resolution to the effect that their remuneration should be 3000 guineas per annum, free of income-tax, to include the remuneration to the Directors representing the Company at the Board of Conservators of the River Lea. He recently attended a lecture by Dr. Frankland at the Royal Institution, when he heard him say that within an area of 15 miles around London there was water enough to supply this great Metropolis for a hundred years. If this was the case, it was a monstrous absurdity to talk about going to Wales, which was dependent on the rainfall for water.

Mr. Jeffries seconded the motion, which was carried unanimously.

The Chairman, in acknowledging the vote, expressed the gratitude of his colleagues and himself at the shareholders' generosity. It was not to be denied that there was a great increase in their responsibility and in their work at the present time; while they had constantly to fight for their rights and the maintenance of their property and privileges. Hitherto, though they had never been the assailants, he thought they had been tolerably successful.

Mr. Illsley then proposed, and Dr. Chesshire seconded, a vote of thanks to the Chairman and Directors.

The Chairman, in reply, said he could only again express the cordial thanks of his colleagues and himself. He desired to mention one point which he omitted when referring to the quantity of water in their reservoirs. He forgot to state that they hoped to have 1200 million gallons of water in the autumn, to meet any demands that might be made upon them.

On the motion of Mr. Tendron, seconded by Dr. Chesshire, a vote of thanks was passed to Mr. Bryan, Mr. Crookenden, and their staffs.

The Secretary, in acknowledging the vote, stated that the difficulties they had experienced in the past year had not been with the people they supplied with water, but with certain professional agitators. They recognized the kind way in which their consumers dealt with the trouble which arose, and over which the Company had not the least control.

Mr. Bryan also returned thanks for himself and the staff under him.

Mr. Tendron remarked that the shareholder sitting by him had said he wished that the Directors would increase Mr. Crookenden's salary by £250 a year. He had himself said nothing about this, because the question of the officers' remuneration was frequently left with the Board. He was sure that if the Directors proposed anything of this kind, there would be no dissent among the shareholders. He knew, from his official connection with the Company, the way in which Mr. Crookenden worked; and he also knew the respect and esteem in which that gentleman was held by the Chairman and Directors of all the other Water Companies.

The Chairman said that the suggestion might safely be left with the Directors—in fact, the subject had been under their consideration.

The proceedings than terminated.

COLONIAL GAS UNDERTAKINGS.

Reports have recently reached us from several Colonial Gas Companies; and we extract therefrom a few particulars showing the progress of the undertakings.

The report of the Directors of the Australian Gaslight Company states that in the half year ending Dec. 31, 1896, the sale of gas, &c., produced £179,578; and there was a sum of £1965 brought forward—together, £181,543. The expenses of manufacture came to £104,320; lighting and repairing the public lamps cost £8282; and miscellaneous charges amounted to £12,077—making a total of £124,679, and leaving a balance of £56,863. The Directors recommended a dividend of 9s. per share for the six months, free of income-tax. This absorbed £51,134, and left a balance of £5729. The Company's Engineer (Mr. T. J. Bush) reported that the whole of the plant has been maintained in good condition. The value of the incandescent gas system for public lighting has been recognized by the Company; and an installation was in progress at the date of the report (Jan. 25). It was expected that, when completed, Sydney would be justified in putting forward the claim to being one of the best-lighted cities in Australia. It is the intention of the Directors not to stop here, but to extend the system into all the suburbs. At the commencement of the year, the price of gas to both city and suburbs was reduced to 4s. 3d. per 1000 cubic feet; and the public lights to £4 5s. and £20 per lamp per annum for ordinary and 80-candle power lights respectively.

The Brisbane Gas Company had at the close of the half year ending Dec. 31 a sum of £8073 standing to the credit of the profit and loss account, including the balance brought forward. The sale of gas produced £19,416; and the expenses of manufacture, the amount written off for depreciation, &c., came to £11,767. The Directors recommended a dividend of 4½ per cent., amounting to £6295. Adding the dividend-tax of £315, made a total of £6610; leaving £1463 to be carried forward. The Company's storage is being increased by the erection of a 120-feet gasholder, the tank for which has been already completed.

At the half-yearly general meeting of the Launceston (Tasmania) Gas Company, reference was made in the report to the decision come to by the Directors, with the view of reducing the working expenses, and generally from motives of economy, to dispense with the services of their Engineer (Mr. T. S. Cleminshaw, Assoc.M.Inst.C.E.), as already mentioned in the "Journal;" but they expressed their appreciation of the abilities displayed by him in carrying out the extensions of the works and plant during his term of office. Unfortunately, there has been a considerable shrinkage in the sales of gas; but the number of meters in use at the close of the year 1896 was only eight less than in December, 1895, while the use of gas for cooking and heating purposes is steadily increasing. The balance to the credit of the profit and loss account was £4519; and an interim dividend of 4s. per share was payable. The coal carbonized during the half year was 1946 tons 12 cwt. of Newcastle, and 43 tons 6 cwt. 3 qr. of shale. The quantity of gas manufactured was 20,225,500 cubic feet, or 10,164 cubic feet per ton. The Chairman (Mr. W. Hart), in moving the adoption of the report, remarked that the gas supplied to customers for the half year to December, 1896, was 18,237,100 cubic feet, as compared with 18,008,700 cubic feet consumed up to June 30. The supply for the six months ended December, 1896, compared with the corresponding half of the previous year, showed a decrease of 2,641,700 cubic feet. About 1,650,000 cubic feet of this was accounted for by the discontinuance of the street and wharf lamps; leaving about a million cubic feet decrease on account of the introduction of incandescent gas-lights, economizing by consumers, and electric lighting. The great economy of incandescent gas lighting had been proved. The cost of gas for lighting one of the principal churches during the previous quarter had been less than £1; and the premises of a leading firm of booksellers were lighted during the same period for only 12s. The net profit for the half year was £1656, as compared with £1621 for the preceding six months; but the Directors had thought it prudent again to pay only an interim dividend of 4s. per share—leaving the balance of profit to go in reduction of liabilities. An

illustration of the comparative cost of gas and electricity was afforded in the quadrangle of the Post and Telegraph Offices. The cost of lighting by incandescent gas-burners during the past year was £11. The quadrangle was now lighted by three electric incandescent lamps of 100-candle power, which, if used on an average ten hours per night, at the low rate of 3 watts per candle power per hour would consume 3285 units of electricity in the year, the cost of which, if supplied by meter at 6d. per unit, would be £82 2s. 6d. The report was adopted.

The sale of gas, fittings, stoves, &c., by the Maryborough Gas Company, in the second half of the past year, produced £3351; and the total revenue was £4499. The expenses of manufacture, distribution, and management were £534; maintenance and repairs came to £289; coal, lime, and shale cost £613; consumers were paid £664 by way of discounts; and the shareholders received £765 as dividends for the half year to June 30. The total expenses amounted to £3436; leaving £1063 available for distribution. The Directors recommended the payment of a dividend for the six months at the rate of 6½ per cent. per annum, which would absorb £835, and leave £228 to be carried forward.

In their report for the past half year, the Directors of the Rockhampton (Queensland) Gas Company state that, viewing the business as a whole, the position is rather better than it was for the preceding six months. The number of consumers continues to increase, but without a corresponding augmentation in the quantity of gas consumed; the greatest economy being still observed in the matter of light by the Company's customers. The Company, it may be remembered, have an electric light undertaking; and the Directors state that the consumption of electricity has fallen, but they hope to provide for this shrinkage by pushing the use of large arc lamps for public purposes, and also by the introduction of electrical fans and small motors. The gas operations show a profit of £1790 for the half year, which, with the unappropriated balance of £188 brought forward, leaves a credit balance of £1978. The electrical department shows a return of £219, which has gone towards the payment of debenture interest, amounting to £300, the whole of which has been charged to the electric light branch—leaving a difference of £80, represented in the debit balance of the profit and loss account of this part of the undertaking. The net profit for the whole of the Company's business is £1897; and from this the Directors recommended at the meeting of the Company on the 17th ult., the payment of a dividend at the rate of 6 per cent. per annum upon the ordinary shares, and 9 per cent. per annum upon the preference shares, amounting to £1454, free of dividend duty, and the placing of the balance of £443 to the credit of the reserve fund for the maintenance and improvement of the plant.

The Directors of the Wellington (N.Z.) Gas Company reported to the shareholders at the last annual general meeting that there had been the usual steady increase in the demand for gas during the year 1896, notwithstanding which the working expenses had been less. The receipts for gas amounted to £28,768; residuals produced £3377; and the total revenue, with the balance brought forward, was £34,259. The working account came to £14,812, or deducting the stock of gas and products (£561), to £14,251; and the general expenses to £3210. The interim dividend (5 per cent.) paid in July last amounted to £4316; and the balance carried to the profit and loss account was £7920. The Directors recommended a further dividend at the above-named rate. A sum of £2000 has been written off for depreciation; and the balance has been carried forward. Under the supervision of the Company's Engineer and Manager (Mr. H. P. Higginson, M.Inst.C.E.), the manufacturing plant has been thoroughly maintained, and its capacity increased 75 per cent. The mains were extended last year by 150 chains; and 257 new services were put in. Large extensions of the works have been commenced; and they will be completed in time to meet the winter demand.

RIPON CORPORATION GAS FINANCES.

There was considerable discussion at the last meeting of the Ripon City Council on the finances of the Gas Department. It appeared from the minutes of the Gas Committee that the Deputy Town Clerk (Mr. J. W. Kirkley) had been instructed to prepare a report as to the cost of gas production during the year 1895-6. His analysis of the accounts showed that the net cost of gas (after deducting the sale of residuals) was 2s. 5·770d. per 1000 cubic feet; and sinking fund and interest required 9·508d., making the total cost 3s. 3·278d. Through the capital account having been exhausted, the following items were paid out of revenue: New mains, 2·220d. per 1000 cubic feet sold; new meters, 1·662d.; and new retorts (balance), 0·936d.—a total of 4·810d. According to the returns, Mr. Kirkley said he was convinced that the Committee could not afford to allow (as they were now doing) 20 per cent. off the present price of gas for heating purposes. Even assuming that the above special items had not been paid out of revenue, the amount to be provided for all other charges would have been 2s. 10·459d. per 1000 cubic feet sold; whereas they had sold the gas for 2s. 8d. for stoves, &c., and 3s. 2d. for illuminating purposes. He suggested that further consideration should be given to the financial position when the accounts for the past year were balanced up, as he believed the extraordinary expenditure would be considerably less than in the two previous years. The Committee stated that they regretted to find that owing to the exhaustion of the capital, and the necessity of carrying out extensions and improvements from revenue, the report showed a loss on the sale of gas. They, however, proposed that the consideration of a recommendation as to the charges for gas being revised should be postponed until the Deputy Town Clerk was able to present his report on the finances for the year ending the 25th ult. The financial position of the department was criticized at some length by Mr. Wilkinson, who, at a former meeting, had made a charge of mismanagement against the Committee. The Committee's suggestion was adopted.

Ongar Water Supply.—The shares in the Company which has been formed at Ongar for the purpose of providing the town with a water supply, have nearly all been taken up by the residents. A good supply of water has been tapped at Fyfield; and the construction of water-works is to be put inhand almost immediately.

MEDICAL OPINIONS ON WATER GAS.

The following is the letter addressed to the "British Medical Journal" by Surgeon-Lieutenant-Colonel Thomas Cayzer, of Garston, on the subject of water gas, to which reference is made in our editorial columns:—

The danger of poisoning by the use of water gas seems to be but little noted; yet the poisonous carbon monoxide is distributed as water gas in many populous districts. My course of study last year led me over the ground which is covered by this question; and in January last I was asked by a Committee of our local District Council to give them some information on the subject. Two deaths from carbon monoxide poison had occurred, and had been dealt with at Coroners' inquests here; three other dangerous cases had occurred; and to my own knowledge three cases of modified poisoning from the same cause have occurred since I met the Committee in January.

Our district of Garston is the one in which the water gas of Liverpool is made; and we had the gas in slightly varying proportions supplied for some time, until the subject has been ventilated publicly. There is little, if any, now. The manufacture of water gas and its distribution are becoming large questions; and I think they are worthy of mention in the "British Medical Journal," which devotes so much space to matters of public health.

I have not dealt with the illuminating power, which goes from good to bad, and to worse, by clogging the burners; nor have I spoken of the deficiency of caloric. Bulk for bulk, coal gas is represented by caloric 5·3, and water gas by 2·7; and the carbon deposits are marked in rooms and in the burners, even with the incandescent light. The question of health and danger alone concerned me with the Council and the Press.

I do not enlarge upon the subject now, as my brethren will be well aware of the nature of the water gas; and it would be presumptuous in me if I attempted to teach them this branch of toxicology. I only wish to call their attention to it. I have had much correspondence on the subject, and would be happy to answer any queries from any fellow-practitioners as far as I can.

I need hardly add that the deaths and dangerous poisonings have been caused by escape of gas from unignited burners or from leakages, and not from the gas in combustion when fully burned. I have not entered into the question of the relative cost of coal gas and water gas—that is one for financiers, though the enhanced cost of the enriching oils must tell there also. Nor have I mentioned the subjects of illegality and breach of contract—those are for the lawyers.

The foregoing letter called forth the following editorial remarks from our medical contemporary:—

The letter from Surgeon-Lieutenant-Colonel Cayzer in this issue deals with a matter of public interest which ought to receive careful attention. Gas companies and corporations all over the country are introducing, if they have not already done so, carburetted water gas as a substitute or partial substitute for coal gas. From the point of view of economy and convenience in production, there is no doubt that water gas presents many advantages. On the other hand, its use seriously increases the danger of poisoning by gas; and the economy of production has probably already been paid for by a very considerable sacrifice of life. It is unquestionably the case that, as a well-known gas manager is said to have tersely remarked, in reply to complaints, "Water gas is supplied for illumination, not for inhalation."

While it is possible that the danger arising from the introduction of carburetted water gas has sometimes been exaggerated, there can be no question of the reality of this danger. Both ordinary coal gas and water gas owe their poisonous action to the presence in them of carbonic oxide; but while coal gas usually contains about 5 to 10 per cent. of carbonic oxide, water gas contains about 30 to 40 per cent. Roughly speaking, therefore, water gas is four or five times as poisonous as coal gas.

Carbonic oxide itself owes its poisonous properties simply to the fact that it has a strong affinity for hæmoglobin, and that the compound known as carboxyhæmoglobin is incapable of combining with oxygen in the lungs. The oxygen-carrying power of the hæmoglobin is thus abolished; and death results from the consequent cutting off of the oxygen supply to the brain and other tissues. A mixture of 1 part of carbonic oxide to 1000 parts of air, if breathed for about an hour, puts out of action about half of the hæmoglobin contained in the blood, and reduces a man to a state of almost complete helplessness. About 2 parts per 1000 will cause death in animals, and would probably do the same in man if the period of exposure were sufficiently long. It is, however, a mistake to suppose that much lower percentages than those named would ultimately cause danger or death from progressive accumulation of the poison in the blood. After an hour or two, absorption by the hæmoglobin fortunately ceases, so that the symptoms, if any, do not increase. With less than 1 part in 1000 parts of air, the maximum effect on the blood is so small as to be practically of little or no importance. Another misapprehension is that the compound of carbonic oxide and hæmoglobin is perfectly stable, and cannot be broken up in the body. It has been conclusively shown that this compound is dissociable, and that when fresh air is again breathed the carbonic oxide is within five or six hours eliminated in the expired air—the hæmoglobin being left behind uninjured. The action of carbonic oxide is so very gradual and stealthy, that persons exposed to it are commonly rendered incapable of movement before they are aware that there is anything wrong. In the case of an escape of gas into a bedroom, for instance, a person might awake and become aware of the smell, but be utterly incapable of getting out of bed or summoning assistance.

Usually only a certain percentage of carburetted water gas is mixed with the coal gas; but when there is any unusual demand, as in times of fog, almost pure water gas may be supplied to the consumers. The reason of this is that water gas can be far more rapidly prepared than coal gas. Hence sudden demands are met by the manufacture of water gas rather than of coal gas. As water gas contains from 30 to 40 per cent. of carbonic oxide, it is evident that a mixture containing as little as 1 part of water gas in 200 parts of air may produce fatal effects; whereas in the case of coal gas at least 1 part in 50 parts would be required.

The only safeguard against insidious poisoning by accidental escapes, whether of coal gas or of carburetted water gas, is afforded by the sense of smell, which will detect a much smaller proportion than would be

necessary to produce dangerous effects. In the case of persons asleep, this safeguard would, however, be non-existent; and nearly all the cases of gas poisoning at present occurring are due to escapes of gas during the night—the victim being found in the morning dead or dying.

To what extent the recent introduction of water gas has increased the usual number of deaths from gas poisoning it is impossible to say—and reliable figures on the subject would be of much practical value. Besides the cases referred to by Surgeon-Lieutenant-Colonel Cayzer, reports reach us from Liverpool, Belfast, and other towns, of a number of recent cases; but in the absence of comparative statistics, and of definite information as to the composition of the gas actually supplied, it is hardly possible to arrive at any satisfactory summing up of the facts of the case. It appears to us to be little short of a scandal that, in defiance of the gravest warnings from medical men, so many of the gas companies and corporations should be permitted to render their lighting gas more and more poisonous, as they are undoubtedly doing at present. They have in some cases sheltered themselves behind "expert" opinion of the usual type. But the broad facts of the case, as we have stated them above, are absolutely clear; and no amount of special pleading will explain them away.

TURTON AND THE GAS CLAUSES OF THE BOLTON IMPROVEMENT BILL.

The promotion by the Bolton Corporation of an Improvement Bill containing clauses relating to the gas undertaking has suggested to Turton (which is supplied by Bolton) that the time is opportune for an effort being made to secure the abolition of gas-meter rents and a reduction in the price of gas. It is anticipated that, if this object is attained, at least 500 consumers would be benefited each by something like 8s. per annum—representing a total saving of £200 a year. The District Council have consequently decided to oppose the Bill; and their action has been endorsed by a well-attended meeting of ratepayers, at which the Chairman of the District Council (Mr. T. G. S. Garnett) presided, and dealt with the subject at considerable length. Having stated that the gas clauses of the Bill mainly affected Turton, he said they had long had a grievance with respect to the differential charge for gas; for the small consumers paid 6d. per 1000 cubic feet more than the Corporation charged the consumers in the borough or within a radius of two miles of the borough. This difference was too high. The total cost of the gas-works originally was £418,000; but up to March 31, 1896, the actual cost was £663,789. All the money spent upon the works since their purchase had been added to the capital account. There had not been that reduction for depreciation which he maintained there ought to have been. The Corporation made out that the sum of £261,405 carried to the relief of the rates was only 3 or 3¼ per cent. on the capital account. But he maintained that the capital of £663,789 ought to have been reduced by considerably more than one-half; and if this had been so, the amount devoted to the relief of the rates would have been about 10 or 11 per cent. Well, then, £261,405 had gone to the relief of the rates; and the sum carried to the reserve fund for renewals was £208,375. This seemed a large amount for renewals; and he held it to be more reasonable to describe it as a depreciation fund, and to have deducted it from the inflated capital account. The amount carried to the sinking fund in 23 years was £36,754, which gave an average of £1600 per year. He believed last year £1960 was applied; but whatever the amount, he contended it was much too small, for on the capital of £663,789 it practically meant only ¼ per cent. The idea was, of course, to keep the depreciation or sinking fund account as low as possible, and the capital account as high as possible, to reduce the percentage of profits paid for the relief of the rates. During the 23 years, there had been appropriated for dividend on stock £47,476; for interest on loans, £90,324; and for annuities, £334,655. Therefore, during the 23 years, there had been a gross profit from the gas-works of nearly a million of money. He believed the actual figure was £978,981. If the sinking fund during that period had been what it ought to have been, it would have reduced the capital account of £663,000 to a little over a quarter of a million. On the huge amount the Corporation had placed to the credit of rates—and which he held to be 10 per cent. against their 3 or 3¼ per cent.—they ought to base their opposition in Parliament. As they were aware, the price charged for gas in Turton was 3s. 6d. gross, 3s. net; and he held that it ought to be reduced to the amount paid by Tonge and Astley Bridge. Why they were called upon to pay more than these townships, he was at a loss to understand. As a large consumer, he had no meter-rents to pay, and cheaper gas; and he wanted his fellows to be treated in a like spirit. The object of the District Council in opposing the Bill was to do away with the differential charges, to limit the profit transferred to the relief of the rates, to obtain a fair share of the profits, to have proper tests of the quality of the gas, to have access to the accounts, and to obtain power to purchase the Turton portion of the supply. After considerable discussion, the meeting, as intimated, sanctioned the opposition.

Completion of a New Reservoir for Liverpool.—The members of the Water Committee of the Liverpool Corporation last Tuesday inspected the new reservoir at Breeze Hill, which is designed for meeting the increasing demands of Bootle, Seaforth, Waterloo, and adjoining districts. The contract for the work was let to Messrs. Holme and King on July 30, 1895; and its cost has amounted to £16,661. The site of the reservoir is at an elevation of 145 feet above sea-level; and the population to be supplied is about 80,000—requiring an average daily supply of from 2 to 3 million gallons. The capacity of the reservoir exceeds 6 million gallons. Its length is 268 feet; breadth, 240 feet; and average depth, 16½ feet. The area at top water is 7147 square yards. The arching of the roof consists of seventeen rows of parallel arches, 12 feet span, and 240 feet long, with 34 groined abutment arches, 12 feet span, and 22 feet long. The arches are covered with soil, which will be grassed, and the top of the reservoir laid out with walks. The walls of the reservoir are composed of concrete, with clay puddled backing, and lined with asphalte. The piers which carry the arches are of brickwork, and the floors of concrete, with a facing of asphalte.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The change has been made in the management of the Edinburgh and Leith Gas-Works; but it was done without any ceremony, and therefore calls for no comment. I hear that Mr. Mitchell has left the city on a short holiday.

In Stirling, the opposition to the acquisition of the gas undertaking by the Corporation has descended to sheer and irredeemable ridicule. On Monday of this week, a letter appeared in some Glasgow newspapers—one of those contemptible letters which people write who are ashamed to put their name to them—in which the allegation was made that some who had signed the petition against the Corporation Bill were being urged by councillors who are in favour of the Transfer Bill to sign another document, in which they were made to withdraw their former signature; and that they were being pressed to do this by misrepresentations, to the effect that the opponents of the Bill would be held personally liable for several thousands of pounds of expenses. The writer assured the ratepayers that there was no foundation for the threat as to expenses; for, in the first place, the money to defray the necessary expenses had been found, and, in the second, it was absurd to suggest that Parliament would sanction such procedure. As to the second of these reasons, I am disposed to think that the writer of the letter must have been looking upon his own reflection in a mirror when he wrote about parliamentary procedure. I am not very familiar with parliamentary regulations as to expenses, though I shall be surprised to learn that Parliament would do more, in a case of this kind, than simply allow the opponents, in the event of the Bill passing, to pay their own expenses. But I know that the argument is being used by those against the Bill that, in the event of the Bill not passing, the members of the Corporation who are promoting it may be held personally liable in the expenses. Authority for this view is possibly to be found in what took place in Edinburgh a good many years ago, where a Corporation Bill was lost, and where a Town Councillor who was opposed to it successfully objected to the expenses of the promotion of the measure being defrayed out of the rates; and it was only when he was got out of the Council, that the money could be paid. In regard to this example, I would recommend anyone on whom it may be plied to think twice before he is influenced by it. The difficulty, be it observed, was not because of any order of Parliament; for in such a case the expenses could never have been taken out of the rates. It was a local condition which prevented the payment out of the rates; and on this subject, probably some enlightenment might be got in the perusal of a document which is known as "the sett" of the burgh, in which, I understand, there are some very pronounced restrictions upon the powers of the Town Council. The subject is not worth going into further; but I have shown that the argument about liability for expenses is being used on the side of the opponents of the Bill, and not on that of the promoters. As to the other statement, that the money had been provided already, how does it tally with the fact that on Wednesday night—two days after this letter appeared—the Bannockburn Select Choir gave a concert, under the auspices of the opponents of the Bill, in the Arcade Hall in Stirling, in aid of the ratepayers' defence fund? To say nothing of the silliness of raising money by such a means for the defraying of expenses incurred in the interests of the public, it is manifest that the money has not been raised. But, indeed, I do not expect that the opposition will amount to much. Where is evidence to be obtained which would convince a Parliamentary Committee that the municipal management of gas undertakings in Scotland has not been a success? Again, the Police Commissioners of Stirling were elected by the ratepayers to conduct the business of the town. They have acted within their powers in entering upon these negotiations; and if Parliament were at the bidding of a local clique to decline to sanction what they have done, it would be striking a fatal blow at representative government in municipal matters. The probability is that the opposition will not obtain *locus standi*, unless they go as individuals, when they might be allowed to state how they expected that the transfer would prejudicially affect them—not how it would affect the community generally. On this subject, there is an instructive incident in Perth, which I observe has been brought under the notice of the community of Stirling. It is to the effect that when, two weeks ago, the Corporation of the city were promoting their Bill, it was opposed by one individual, who considered that the building of a bridge would injure him; and his opposition ran the Corporation into expenses to the tune of about £5000. If, it is pointed out, the opposition in Stirling should do the same, the burden on the rates would be as much as 1s. 4d. in the pound. With this prospect before them, those who proceed further with opposition to the acquisition of what has been proved to be a successful undertaking, must be possessed of shorter intelligence than people who have been able to rise to the position of ratepayers might naturally be credited with.

The Hamilton Town Council had before them, on Thursday, a proposal to charge 5d. per 1000 cubic feet more for gas supplied to consumers outside the burgh boundaries than to those within the burgh. It seems that a gas-main which supplies about seven consumers outside the burgh, was leaking so badly that it was necessary to renew it; and that the cost of the work amounted to £55. As the annual revenue from the gas supplied to these seven consumers is only £37, it is evident that the profit upon the consumption would never pay for the new mains; and hence the proposal to raise the price of gas. Mr. Hay moved that the proposed increase be not agreed to. He objected to the establishment of differential rates; and he hinted at the possibility of the proposal having been made in order to punish a member of the Council who did not approve of something which had been done at the gas-works. Treasurer Keith dissipated this notion, by pointing out that if they had not raised the price of the gas consumed, they would have been obliged to have charged the proprietors 10 per cent. upon the cost of the pipe. He doubted if they would have been able to have recovered this; and he considered that the sound principle was to raise the price of the gas. The recommendation of the Committee—which is in accordance, not only with practice, but with common sense—was adopted by ten votes to five. As was said here the other week, those who live outside burgh boundaries cannot expect to secure at the same charge the comforts or conveniences of those who live within.

The Gas Committee of the Dundee Town Council, on Monday, considered a report by the Engineer and Manager, Mr. William M'Crae, and the Gas Treasurer, Mr. A. J. Strachan, upon the subjects of the hiring of gas-stoves and the use of prepayment meters. Upon the former subject, it was reported that inquiries of the Commercial Gas Company, The Gaslight and Coke Company, the Edinburgh and Leith Gas Commission, and the Glasgow Corporation showed that the system of hiring out stoves had been a great success, because thereby the sale of gas had been largely increased. It was resolved to extend the present system of hiring out stoves. In the first place, it was agreed that a room should be acquired in a central place, for the display of gas-stoves; and then that stoves should be fitted up free of charge to consumers, in cases where the cost did not exceed 3s. In reference to prepayment meters, the reporters recommended that an experiment with them should be made. The Manager was asked how long a pennyworth of gas would last. He replied that for a cooking-ring, a pennyworth of gas would last three or four hours; and for ordinary lighting, from eight to nine hours. There was a good deal of discussion on the subject; and it was the unanimous opinion that the system was worth a trial.

The Town Council of Glasgow proceeded, on Thursday, to the appointment of the new Electric Lighting Committee which they have resolved to create. It was ultimately agreed that the Committee should consist of 15 members; and the appointment was postponed. It is stated in a Glasgow newspaper that the difficulty in making the appointment lies in the fact that there is a scramble for the office of Sub-Convener. It is recognized that Mr. Mackay should be the Convener; but there are four gentlemen who are anxious to be appointed Sub-Convener.

Mr. R. A. F. A. Coyne, who has held the post of Superintendent of Works for the Edinburgh and District Water Trust since 1872, is about to retire on the ground of ill-health. At a meeting of the Works Committee yesterday, the resolution was come to to place him on the retired list, on a yearly allowance of £200. When Mr. Coyne was appointed, he secured the post out of about forty applicants. At the same time as the Works Committee resolved upon Mr. Coyne's retirement, they also agreed to recommend the Trustees to appoint, as his successor, Mr. W. Black, who has for a long time been in their service, and who has latterly given very great satisfaction in his management of the filtration works at Alnwickhill. Mr. Black's salary is to be £300 a year. When Mr. Coyne became Superintendent, his salary was £210. It was about four years afterwards raised to £400; and for a long time it has been £500. People are beginning to wonder when this epidemic of retiring the heads of departments in Edinburgh upon pension is to stop. This is the sixth within about three years. There is already a Town Clerk, a City Chamberlain, a Collector of Rates, a Firemaster, and a Gas Engineer; and now there is to be a Water Superintendent. Such an extensive shedding of the leading officials of public departments is to be deplored.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 3.

Sulphate of Ammonia.—There has again been a very quiet market; and a further decline in values—the closing quotations being £7 15s. per ton f.o.b. Leith, and £7 17s. 6d. per ton f.o.b. Hull and Liverpool. Producers generally, finding supplies accumulating on their hands, have become more anxious to be making sales; while, on the other hand, direct orders have been scarce, and speculators, hoping for a further decline, have only been covering urgent orders. Shipments continue upon an increasing scale. But these are mainly against contracts effected some time since by the large makers; and they therefore do not represent a corresponding amount of present buying.

Nitrate of Soda is quiet at 8s. per cwt. for good, up to 8s. 3d. for refined quality.

LONDON, *April* 3.

Tar Products.—The market has been somewhat irregular, and difficult to follow. Though 90 per cent. benzol is quoted at 2s. 6d., sales have been made below this figure; and, on the other hand, while 50-90's have been quoted at 2s. 3d., sales are slightly in excess of that. At the moment, there are no buyers for 90's; but a good deal of inquiry exists for 50's. It is likely that the latter article will change positions with 90's; and, as has occurred once before, it is likely to occupy the premier position in respect to value. This position undoubtedly arises from the scarcity of toluol; carbonizing naphtha containing little or none of this article. Pitch does not improve; and important business has been done at prices quoted below—the difference in value representing the difference in freights from the various ports. Solvent naphtha is firm; and business in heavy naphthas continues steady. Tairty per cent. naphtha is slightly improved. Carbolic acid is scarce, and likely to be dearer. The reported sale of a large quantity of inferior anthracene at 4d. has utterly demoralized that product in the market; and values are variously stated at 1d. to 2d. for each quality below former quotations.

Market prices are as follows: Tar, 15s. to 20s. Pitch, 20s. to 22s. 6d. Benzol, 90's, 2s. 4d.; 50's, 2s. 4½d. Toluol, 2s. 2d. Solvent naphtha, 1s. 7½d. Crude, 30 per cent. naphtha, 1s. 0½d. Creosote, 1½d.; liquid, 1½d. Heavy oils, 35s. Carbolic acid, 2s. 7s. Naphthalene, 55s.; drained salts, 25s. Anthracene "A," 6½d. to 7½d.; "B," 5d. to 6d.

Sulphate of Ammonia does not improve with the advance of spring; and this notwithstanding it is less in price than nitrate of soda, which contains 20 per cent. less nitrogen. Heavy shipments have taken place; and there are sellers at £7 15s. to £7 17s. 6d., less 3½ per cent. at all ports.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The position in the coal trade here shows a continued weakening tendency—especially as regards the better qualities of round coal; and though there is no quotable alteration in list rates with the opening of the month, local coalowners are finding it difficult to maintain full prices, owing to the increasing keenness of competition from other districts. Steam and forge coals are in moderate request; but with supplies ample, prices continue low. At the pit mouth, best Wigan Arley remains at 10s. to 10s 6d. per ton; Pemberton four-feet and seconds Arley, 8s. to 8s. 6d.; common house coal, 6s. 6d. to 7s.; and steam and forge coal, 5s. 6d. to 6s. Engine fuel, with the lessened production of slack, is not quite so plentiful in the market, with the result that prices in some directions show rather a tendency to harden. Generally, however, prices are not more than steady at late rates. Common slack averages about 3s. to 3s. 6d. per ton; medium sorts, 3s. 9d. to 4s. 3d.; and best qualities, 4s. 6d. to 4s. 9d.

Northern Coal Trade.—The past few days have witnessed an increased demand for coals in the North, owing to the approach of the shipping season to the Baltic and the strong desire of some shippers to get goods sent away in advance of any labour stoppage on the railway. Best Northumbrian steam coals are quoted at from 8s. 3d. to 8s. 6d. per ton f.o.b.; and steam small coals, at 3s. 9d. In the gas coal trade, the greatest interest is centred in the decision of the contracts that have been entered into for part of the supply of the London Gas Companies. It may be said that, in the case of the South Metropolitan Company, there has been practically a completion of their contracts; and that the price is about 6s. 6d. per ton f.o.b., which is practically an advance of about 3d. per ton. In the case of the greater Company, it is believed that a portion of the supply has been arranged for; and it is definitely stated that the f.o.b. price is "not over 6s. 3d. per ton." But it is not known what is the extent of the quantity purchased, nor what are the conditions. Gas coke shows no change in price; but the output is now decreasing with some rapidity.

Scotch Coal Trade.—It would almost seem as if forward contracting has been carried too far in the meantime, for the colliery owners. Advances in wages are coming into force; but current prices do not rise, and those who have sold coal for forward delivery at low prices have nothing by which to balance the increased outlay upon wages. With the exception of ell for Baltic ports, the forward market has received a check. Current business remains stationary. There is a large overturn for home consumption, at previous prices. The quotations are: Main, 6s. 6d. per ton f.o.b., Glasgow; ell, 6s. 9d. to 7s. 3d.; splint, 6s. 9d. to 7s. The shipments for the week amounted to 129,652 tons—a decrease upon the previous week of 3514 tons, but an increase upon the corresponding week of last year of 2251 tons. For the year to date, the total shipments have amounted to 1,543,454 tons—an increase upon the same period of last year of 85,203 tons.

Exmouth Gas Company.—The report presented at the 54th annual meeting of this Company on Tuesday stated that, after providing for the fixed charges of the year, there remained a balance of £1768 to the credit of the profit and loss account. Payment of the usual dividends would absorb £640; leaving £1128 to be carried forward. The make of gas had increased by 1,863,000 cubic feet, and the consumption by 8·2 per cent., as compared with the previous twelve months. The Chairman (Mr. J. Palmer), in moving the adoption of the report, stated that the town was growing, and that the consumption of gas was increasing; and they had to look forward to further expenditure in the future in order to provide storage for gas and coal and additional purifiers. At present they were fitting up a number of prepayment meters and stoves. The charge for gas had been reduced during the year by 3d. per 1000 cubic feet; and the price, which was 12s. 6d. when the Company began business, was now 3s. 6d. The Directors were watching the advance of carburetted water gas. The report was adopted.

The Basis of Water-Rates at Portsmouth.—At the last meeting of the Portsmouth Town Council, the Water Committee recommended that the resolution authorizing them to take Counsel's opinion in regard to the charges made by the Water Company being based upon the rateable instead of the rental value of the property should be rescinded. This course was recommended because it had been found, upon referring to the minutes, that at the time the Water Company promoted their original Bill, a resolution was carried giving the Company power to charge upon the rental value of the property (see *ante*, p. 491). Alderman Ellis moved, as an amendment to the Committee's recommendation, that the Committee should be instructed to obtain Counsel's opinion upon the matter at issue. He mentioned that cases were known where people had refused to pay on the rental value of their houses, and had not been pressed for payment by the Company. Several members spoke in favour of obtaining Counsel's opinion; and the amendment was carried.

Anniversary of the Gas Workers' Union.—Last Sunday afternoon, a demonstration was held in Battersea Park to celebrate the eighth anniversary of the National Union of Gas Workers and General Labourers. There was a large gathering. Mr. William Thorne (the General Secretary) presided at No. 1 platform, and said that the Union had passed through a trying year. They had paid out £5755 in dispute allowances in 32 sections of labour; they had gained £600 as compensation under the Employers' Liability Act; and they had obtained increased wages for 4000 workers. In the last quarter, they had added 1300 members in the London district alone; and the Union was now the eighth strongest in the kingdom. The following resolution was enthusiastically carried: "In celebrating the eighth anniversary of the Gas Workers' Union, this mass meeting calls upon the workers to join their Trade Unions, and to take part in political action with a view to combining the organized forces of labour in one great international army, to fight against and break down the organized forces of capitalism."

The Lighting of Stratton and Bude.—There was some discussion at the parish meeting at Stratton on the 29th ult. respecting the lighting of the district. As was stated in our "Electric Lighting Notes" last week, a scheme has been put forward for lighting the district by electricity. The Rev. B. R. V. Mills urged the necessity of something being done to improve the lighting; and he moved that the Parish Council be asked to consider the propriety of lighting the district with gas or electricity. Personally he was in favour of the electric light, which would be just as economical as gas, and possessed some advantages which gas had not. A rate of 6d. in the pound, to which the Council were limited, would not be sufficient to obtain and maintain this illuminant; but voluntary contributions could be procured to make up the deficit. This, he thought, would be better than having a private company. Mr. W. H. Burnard supported the proposition, but said he considered gas preferable to electricity on the ground of cost and convenience, and expressed the hope that the Council, before proceeding further, would obtain the advice of a gas engineer. The resolution was carried; but many present abstained from voting.

Colne Corporation Water Bill and the Keighley Corporation.—The Corporation of Colne have agreed to the insertion in their Water Bill of a clause fully safeguarding the Keighley rights to the gathering-ground near the Watersheddles reservoir; and the opposition of Keighley will consequently be withdrawn.

Incandescent Gas Lighting at Clevedon.—On Monday last week the sea-front at Clevedon was lighted by incandescent gas-burners, and presented a very bright and attractive appearance. Forty burners are employed, fixed in twenty 28-inch hexagon lanterns, designed by the Manager of the Gas Company (Mr. S. Dawes). The light has proved exceedingly steady and effective—illuminating not only the promenade but the road and houses opposite.

The Charges for Water Service Connections at Birmingham.—From the 1st inst., a new scale of charges for water services and connections between the mains and the premises of consumers came into force at Birmingham. Within a radius of 2 miles of the Council House, the charge for the first lead service laid in a trench will be: ½-inch, 38s.; ¾-inch, 43s.; 1-inch, 56s.; 1¼-inch, 61s.; 1½-inch, 66s. For each service placed in the trench after the first, the charge will be 5s. less. Outside the 2-mile radius, an extra charge of 2s. 6d. for the first service will be made; but for services subsequently laid in the same trench, the charges will be the same as within the radius. The cost of maintaining and repairing services, hitherto charged to consumers, will in future be borne by the Corporation.

An Assessment Question under the Lighting and Watching Act.—At a meeting of the Crayford local authorities last Friday, it was reported that the case of *The Overseers of Crayford v. Rutter* (a special case stated by the West Kent Quarter Sessions on an appeal in respect of rates made, under the Lighting and Watching Act, on a brick-field belonging to the defendants) had been decided by Mr. Justice Cave. The question raised was whether this field should be assessed as "land" or "houses, buildings, and property other than land;" and the point was of some importance, as land is rated at one-third below the other class of property. His Lordship held that the field should be assessed as land, and that the rate should be 2d. instead of 6d. in the pound as claimed by the Overseers.

Light Railways and Water-Works.—Lord Jersey and Colonel Bughey, in their capacity of Commissioners appointed by the Board of Trade, have held official inquiries in connection with two schemes for light railways in the district of Dartford. In both cases, Mr. A. Dickson, the Secretary of the Kent Water Company, opposed on behalf of that Company. In the first scheme, an undertaking was given that the Company's mains would not be interfered with, and that the bridges should be left so that the pipes might be extended. In the second scheme, the opposition was more serious; the limits of deviation including a part of a 24-inch main, over which the promoters were willing to put a culvert. Mr. W. Morris, M.Inst.C.E., the Company's Engineer, said the Wilmington station of the Company was most important; and it would be a serious matter to interfere with the mains and works in that neighbourhood. Mr. Poyser, on behalf of the railway promoters, said they were willing to do anything Mr. Morris and their own Engineer might think necessary; any difficult points to be submitted to an Arbitrator.

Darlington Gas and Water Profits.—At a meeting of the Darlington Town Council last Thursday, the Mayor (Mr. George Marshall) moved the adoption of the minutes of the Gas Committee. In doing so, he mentioned that the net profit on the past year's working was £3433, which was £843 less than the previous year when they considered that there had been a smaller sum by £1316 paid for interest and redemption. The make of gas had been considerably larger than in the previous year; the addition having been 3½ million cubic feet. Mr. Barron asked if the Committee were doing anything in respect to the introduction of "penny-in-the-slot" meters. The Mayor replied that nearly a year ago he brought the question before the Gas Committee; but he failed to get the requisite majority of the members on his side. It seemed a matter of regret that they should not adopt the system, because it had proved a profitable one wherever it had been put in force. The minutes were passed. The Mayor next moved the adoption of the minutes of the Water Committee. He stated that the net profit for the year was £3476; and there was a smaller quantity of water pumped than in any previous year since 1890. The increased profit was £2540; but when they considered the reduced liquidation, amounting to £1533, the net additional profit was £1007. The loss from the stoppage of the Iron and Steel Works was above £1200. He thought they must regard the Water Department as being in a satisfactory position. The minutes were confirmed.

Sales of Stocks and Shares.—At the Mart, Tokenhouse Yard, E.C., last Wednesday, Messrs. Edwin Fox and Bousfield sold stocks and shares in the following Gas and Water Companies at the prices named: Gas-light and Coke 4½ per cent. debenture stock at 155, 6 per cent. debenture stock at 212, 10 per cent. preference stock at 313 to 314, 6 per cent. preference stock at 181½, and 4 per cent. debenture stock at 143 to 143½; South Metropolitan 5 per cent. debenture stock at 175 to 175½; Commecial 4½ per cent. debenture stock at 155 to 156; Brentford 4 per cent. debenture stock at 135½; Croydon Commercial 5 per cent. debenture stock at 159; Brighton and Hove 4 per cent. debenture stock at 135½, and ordinary stock at 202 *ex div.*; East London Water ordinary stock at 226 to 227, and 4½ per cent. debenture stock at 167; Chelsea ordinary stock at 335; Lambeth 4 per cent. debenture stock at 148 *ex div.*, and £100 10 per cent. shares at 274; Southwark and Vauxhall 4½ per cent. "A" debenture stock at 148, and ordinary stock at 157; and New River £100 new shares at 442 *ex div.* On the same day a few £25 shares in the Weardale and Shildon Water Company were sold by auction at Durham at £39 16s. and £39 18s. apiece. Seventy-two £5 shares in the Consett Water Company secured a purchaser at £9 7s. each; and five others were bought for £9 4s. 6d. At Steyning, a parcel of fifteen £10 shares (£6 paid) in the Steyning Gas Company, on which a dividend of 17s. per share has been paid for some years, realized £273 15s. Last Thursday, Messrs. Alexander, Daniel, and Co., of Bristol, sold by auction £15,000 of Bristol Water-Works 7 per cent. maximum consolidated ordinary stock. The reserve price was £150 per cent. The highest figure reached was £155 5s.; and the lowest, £154 5s.—the average being £154 10s. The total amount which would have been realized at the reserve price would have been £22,500; the actual amount produced was £23,222 15s. On the same day at Wellington (Salop), 35 £10 shares in the local Gas Company secured purchasers at from £26 15s. to £27 17s. 6d. each.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 768).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	24—26	..	4 0 9
100,000	10	,,	7½	Do. 7 p. c.	17½—18½	..	4 1 1
300,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	108—111	..	4 10 11
200,000	10	29 Oct.	5	Belgrano (B. Ayres), Limited	9½—10	..	5 0 0
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	102—105	..	4 15 5
200,000	5	12 Nov.	6½	Bombay, Limited	6½—7½	..	4 6 8
40,000	5	,,	6½	Do. New, £4 paid	5—6	..	4 6 8
380,000	Stck.	26 Feb.	12	Brentford Consolidated	285—290	..	4 2 9
240,000	,,	,,	9	Do. New	223—228	..	3 18 7
50,000	,,	,,	5	Do. 5 p. c. Pref.	138—143	..	3 9 11
159,375	,,	11 Dec.	4	Do. 4 p. c. Deb. Stock.	130—134	..	2 19 9
220,000	Stck.	26 Mar.	11½	Brighton & Hove Original	270—275*	+3	4 3 7
208,820	,,	,,	8½	Do. A Ord. Stk.	197—202*	+3	4 4 2
933,500	Stck.	26 Feb.	5	Bristol, 5 p.c. max.	130—135	..	3 14 1
420,000	20	26 Mar.	11½	British	56½—57½*	..	3 18 3
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	23—25	..	4 12 0
71,000	10	,,	8½	Do. 7 p. c.	18—20	..	4 5 0
500,000	10	15 Oct.	6	Buenos Ayres (New) Limited	9½—10	..	6 0 0
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	101—103	..	5 16 6
150,000	20	26 Feb.	8½	Cagliari, Limited	29—31	..	5 6 5
100,000	10	30 Sept.	6	Cape Town & District, Ltd.	15¾—16½	..	3 12 9
50,000	50	3 Nov.	6	Do. 6 p. c. 1st Mort.	57—59	..	5 1 8
550,000	Stck.	15 Oct.	13½	Commercial Old Stock	341—349	..	3 17 4
165,000	,,	,,	10½	Do. New do.	255—260	..	4 0 9
165,000	,,	11 Dec.	4½	Do. 4½ p. c. Deb. do.	150—155	..	2 18 0
800,000	Stck.	30 Dec.	13	Continental Union, Limited.	255—260	..	5 0 0
200,000	,,	,,	10	Do. 7 p. c. Pref.	215—220	..	4 10 11
51,600	Stck.	26 Feb.	14	Croydon Com'cial A 10 p. c.	315—320	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	250—255	..	4 6 3
535,000	Stck.	26 Feb.	5½	Crystal Palace Ord. 5 p.c. Stk	140—144	..	3 12 11
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—143	..	3 9 11
486,090	10	29 Jan.	11	European, Limited	24½—25½	..	4 6 3
354,363	10	,,	11	Do. £7 10s. paid	17½—18½	..	4 9 3
5,896,590	Stck.	12 Feb.	12¾	Gaslight & Coke, A, Ordinary	302—307	−6	4 3 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	110—114	..	3 10 2
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	308—313	+1	3 3 10
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	145—150	..	3 6 8
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	210—215	..	3 9 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	207—212	..	3 6 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	307—312	..	3 4 1
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	180—185	+2	3 4 10
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	137—142	..	2 16 4
294,850	,,	,,	4½	Do. 4½ p. c. do.	150—155	..	2 18 1
908,000	,,	,,	6	Do. 6 p. c. do.	207—212	..	2 16 7
70,000	10	29 Oct.	6	Hongkong & China, Limited	12—13	..	4 12 4
3,800,000	Stck.	12 Nov.	12	Imperial Continental	205—210	−5	5 14 3
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	99—102	..	3 18 5
473,600	Stck.	12 Feb.	3½	Do. 3½ p. c. Deb. Stk ,,	104—107	..	3 5 5
75,000	5	11 Dec.	6	Malta & Mediterranean, Ltd.	5⅞—6¼	..	4 16 2
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	111—113*	+½	4 8 6
250,000	100	,,	4½	Do. 4½ p. c. Debs.	107—109*	+½	4 2 7
541,920	20	12 Nov.	5	Monte Video, Limited	15—16	..	6 5 0
150,000	5	26 Nov.	8	Oriental, Limited	8½—9	..	4 8 11
135,000	5	,,	8	Do. New, £4 10s. paid	7⅞—8	..	4 10 0
15,000	5	,,	8	Do. do. 1879, £1 paid	1½—2	..	4 0 0
60,000	5	26 Mar.	7	Ottoman, Limited	5—5½*	..	6 7 3
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds.	104—109	..	5 10 1
500,000	100	1 Dec.	6	of Chicago } 2nd Do.	104—109	..	5 10 1
250,000	10	30 Sept.	10	San Paulo, Limited	13½—14½	..	6 18 0
5,475,000	Stck.	26 Feb.	5½	South Metrop., 4 p.c. Ord.	142—145	−1	3 12 5
850,000	,,	14 Jan.	5	Do. 5 p. c. Deb. Stk.	173—177	..	2 16 6
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	275—285	..	4 0 10
60,900	,,	,,	8½	Do. B	190—200	..	4 5 0
182,380	10	30 Dec.	10	Tuscan, Limited.	14—15	..	6 13 4
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	101—103	..	4 17 1
				WATER COMPANIES.			
746,159	Stck.	30 Dec.	10½	Chelsea, Ordinary	333—338	..	3 2 2
150,000	,,	,,	5	Do. 5 p. c. Pref.	175—180	..	2 15 6
160,000	,,		4½	Do. 4½ p. c. Pref. Stk., 1875	158—162	..	2 15 6
175,785	,,	26 Mar.	4½	Do. 4½ p. c. Deb. Stock	160—165*	..	2 14 6
1,720,563	Stck.	15 Oct.	7	East London, Ordinary	225—230	..	3 0 10
554,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	162—167	..	2 13 11
393,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	106—108	..	2 15 7
700,000	50	11 Dec.	7½	Grand Junction, 10 p.c. max.	112—117	−1	3 4 1
295,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	148—153*	..	2 12 4
708,000	Stck.	12 Feb.	12	Kent	340—345	..	3 9 7
160,000	,,	,,	7	Do. New, 7 p. c. max.	212—217	..	3 4 6
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	272—277	−1	3 8 7
406,200	100	,,	7½	Do. 7½ p. c. max.	222—227	..	3 6 1
350,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	147—150*	..	2 13 4
500,000	100	12 Feb.	13	New River, New Shares	420—425	..	3 1 1
1,000,000	Stck.	23 Jan.	4	Do. 4 p. c. Deb. Stk.	152—155	..	2 11 7
902,300	Stck.	30 Dec.	6	S'thwk & V'xhall, Ordinary	155—160	−2	3 15 0
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	150—155	..	3 17 5
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175—180	..	2 15 7
1,019,585	,,	30 Sept.	4	Do. 4 p. c. A Deb. Stk.	147—150	..	2 13 4
1,155,066	Stck.	11 Dec.	10	West Middlesex	310—315	..	3 3 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163—168	..	2 13 7

*Ex div.

Oldbury Gas Undertaking.—In the "JOURNAL" last week (p. 737), we gave some particulars as to the financial progress of the gas undertaking of the Oldbury District Council, furnished by the statement of accounts for the past year prepared by the General Manager (Mr. A. Cooke). We now supplement them by a few figures relating to the manufacturing operations. The quantity of coal and cannel carbonized was 7276 tons 16 cwt.; and the bulk of gas made was 83,380,000 cubic feet, of which 78,333 500 cubic feet were sold and 5,046,500 cubic feet unaccounted for (6 per cent.). The make per ton was 11,453 cubic feet, of which 10,764 cubic feet were sold. With regard to residual products, the make of coke and breeze was 4532 tons 10 cwt., or 12½ cwt. per ton of coal carbonized; of tar, 98,441 gallons, or 13·58 gallons per ton; of ammoniacal liquor, 194,355 gallons, or 26·70 gallons per ton. The accounts were passed at a meeting of the District Council held last Friday.

The London County Council and the Southwark and Vauxhall Water Bill.—At the meeting of the London County Council last Tuesday, the Parliamentary Committee recommended the Council to authorize them to take the necessary steps to oppose the Southwark and Vauxhall Water Bill, by which the Company are seeking power to draw from the Thames an additional supply of water amounting to 20½ million gallons a day. Lord Onslow moved, as an amendment, that a petition should be presented to the Standing Orders Committee of the House of Commons (to whom the petition for the Bill has been referred) for the purpose of opposing at that stage the progress of the measure. Mr. H. P. Harris seconded, and Mr. Beachcroft supported, the amendment, and a discussion took place. Mr. H. W. Lawson contended that the additional power the Company were seeking to obtain was bound to enhance the value of the undertaking, and so increase the price they would ask in the event of purchase. Mr. M'Kinnon Wood said the Bill was one of the results of the action of the Government during the past two years. It was an attempt by the Company to make legal their previous illegal action in drawing from the Thames more than the quantity of water allowed. A division was taken on the amendment, with the result that the votes were equal; it was, therefore, declared lost. A further division was taken on the recommendation, when it was carried by a majority of 8.

The Derby "Strike Smasher."—In our references to the recent strike at the Derby Gas-Works, we had occasion to mention Mr. Graeme Hunter, who furnished the men to replace those who threw up their employment. A few particulars of Mr. Hunter's career have been given in a Derby paper; and as he has earned for himself the title of "the boss strike smasher," it may not be uninteresting to reproduce some of them. His home is at Carrick Castle, Argyllshire; and he was brought up as an engineer. After a visit to Burmah, he returned to England, and at once took an active part in the labour struggle—forming first an Employers' Federation, and then a Free Labour Exchange. The first big strike with which he had anything to do was that at Carnegie's steel-works, at Homestead, Pittsburg. This was in 1888, and Mr. Hunter was only a young man then—25 years of age. Thus early, however, he had shown great powers of organization; and he was responsible for taking over 570 men from England to Homestead. Following upon this came the great railway strike in Pullman City; and in this and in strikes at Lisbon, Vienna, and Hamburg, the Caledonian Railway dispute of 1889, the Dublin shipbuilding strike of 1891, the Londonderry strike of the same year, the Bristol strike of 1892, and the Stalybridge strike of 1895, he took an important part. During his career, Mr. Hunter has had many exciting adventures; having been fourteen times shot at, and six times thrown into the water. He is a tall, athletic-looking man, and well able to take his own part against anything but overwhelming odds. He says he is fighting, "absolutely and clearly on the grounds of the right of every Briton to sell his labour in the open market for what he thinks best himself."

The Rejection of the Southampton Corporation Water Bill.—With reference to the collapse of this Bill (as reported in our "Parliamentary Intelligence" last week), a Sub-Committee of the Parliamentary Committee of the Southampton Town Council have prepared a report to show that all necessary arrangements were made for the conduct of the Bill; and that its rejection occurred on the technical point raised by Mr. Pember, Q.C., that the consent of the Council and the ratepayers had been obtained to the promotion of the Bill on the understanding that it was a permissive one, and that, if passed, it did not bind the Corporation to purchase the South Hants Water Company's undertaking. Of this fact, the Sub-Committee say, there could not be the slightest doubt. The Bill merely asked for power to the Corporation to give notice to the Company, at any time within six months after the passing of the Bill, to sell their undertaking to the Corporation. This clause was drawn after consultation with parliamentary experts; and precisely similar clauses had been granted in many other Acts. The object of the clause was to obtain a reasonable time, after the passing of the Bill, to negotiate with the Company. It was never stated or intended for one moment that the Corporation could withdraw after they had decided to give notice to the Company to sell. No evidence was adduced by the opponents to show that a single person had been misled; and the House of Lords Committee did not intimate that the clause must be made compulsory. Had they done so, the matter would have been different altogether; and there might have been some reason for the extraordinary decision at which they ultimately arrived. Such a decision, the Sub-Committee declare, is entirely unprecedented. Under the circumstances, they feel it is only right, in the interests of the water consumers in the areas that have been added to the borough, that further efforts should be made to alleviate the "burden" under which they are now labouring; and they recommend the Council to once more seek to open up negotiations with the Company for the right to supply the added areas with water. Subjoined to the report is a letter from the leading Counsel to the Corporation (Mr. Balfour Browne, Q.C.) in which he says he was surprised and disappointed by the action of the House of Lords Committee. The technical point—which he thinks was a bad one—was not raised during his opening, nor until he had left the room. The clause in the Bill was a "permissive clause," and, of course, it was competent for the Committee to turn it into a compulsory one. The Parliamentary Committee of the Corporation have resolved to recommend that the Directors of the Company be approached with the view of arranging terms upon which they will supply the Corporation with water in bulk for the added areas.

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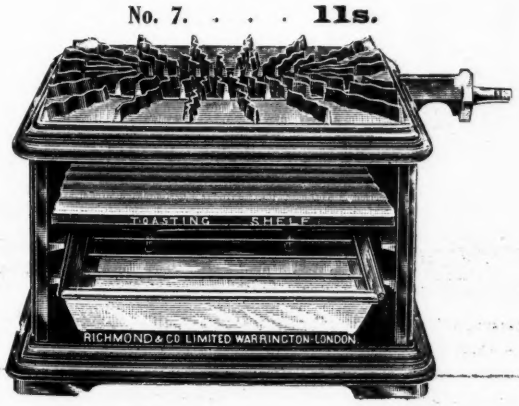

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Sligo Gas Company, Limited.—At the recent annual meeting of this Company, the Directors reported a net profit of £741 on the working in the past year, and they recommended a dividend of 6 per cent., free of income-tax. This would absorb £540, and leave a balance, after providing for the interest on the preference shares, of £117. Notwithstanding that the reduction of 10d. per 1000 cubic feet in the price of gas was in force for the full year, as against only nine months of 1895, the profits were about the same, owing to greater consumption. There has been a considerable increase in gas supplied by "penny-in-the-slot meters," as well as for cooking, heating, and manufacturing purposes; the number of stoves in use being more than in 1895. Under the supervision of Mr. C. B. Tully, the works and plant have been maintained in an efficient condition, at a cost of £788.

The Bradford Corporation and the Clayton Gas-Works.—In compliance with his instructions (see *ante*, p. 491), Mr. W. Wood, the Gas Engineer of the Bradford Corporation, has presented to the Sub-Committee of the Gas Committee a report on the Clayton Gas Company's works, together with his valuation thereof. It is stated that the valuation put upon the concern by the Company is greatly in excess of Mr. Wood's estimate, and that, if purchased by the Corporation at the price demanded, the undertaking would involve an annual loss, as a considerable quantity of the gas made at the Clayton works is sold within the borough. Naturally, consumers of Clayton gas in the borough would expect to be supplied by the Corporation at the price charged in other parts of the borough. It was decided to have the report and valuation printed, and copies supplied to members of the General Committee.

The North Walsham Water Scheme.—A letter has been received by the North Walsham District Council from Mr. C. W. Dalton, Assistant Secretary to the Local Government Board, with reference to the application of the Council for sanction to borrow £4000 for works of water supply. The Board are advised that the water which would be obtained from the gravel at the site of the proposed well is liable to serious pollution; and therefore they are not prepared to sanction a loan for carrying out the proposed scheme. They suggest that the Council should attempt to secure a supply at a greater distance from the town than that proposed, which would be free from all risks of pollution. The Board do not regard the gravel stratum anywhere round North Walsham as a source of supply free from possibility of contamination. The Council have informed the Board that it is intended to sink a well to the chalk.

The Proposed Purchase of the Hunstanton Gas and Water Works.—At a special meeting of the Hunstanton District Council last Thursday, it was reported that the negotiations between the Council and the Gas and Water Companies for the purchase of their undertakings were practically completed. The Council will pay about £20,000 for the two concerns.

Increased Storage for the Whittington Gas Company.—Owing to the increased consumption of gas during the past few years in the district of the Whittington Gas Company, additional storage became necessary; and the services of the Engineer and General Manager (Mr. S. Penny, Assoc.M.Inst.C.E., of Uxbridge) were requisitioned to provide it. He accordingly designed a gasholder 60 feet in diameter and 20 feet deep, capable of containing 60,000 cubic feet of gas, and a tank of the same depth, but 61 ft. 6 in. diameter. The construction of the latter was placed in the hands of Mr. F. Barlow, of Rothwell, Kettering; while the contract for the holder was placed with Messrs. Newton, Chambers, and Co., Limited. In each case the work has been carried out under the superintendence and to the entire satisfaction of Mr. Penny—the Manager (Mr. Everest) rendering valuable assistance.

The Valparaiso Gas Company have placed with Messrs. Ashmore, Benson, Pease, and Co., Limited, an order for a large two-lift gasholder guided on their patent steel cable system.

Mr. Luke Taylor, who for the past fourteen years has held a responsible position at the Tipton Gas-Works, has been appointed travelling representative by Messrs. J. & J. Braddock, of Oldham, in place of the late Mr. H. Shimeld.

Mr. T. D. Ridley, of Cardiff and Middlesbrough, has secured a contract for the extension of the filter-beds of the Cardiff Corporation Water Department. The amount of the tender was £10,114 17s. 6d., which is £433 below the estimate of the Engineer (Mr. C. H. Priestley).

Messrs. R. Dempster and Sons, Limited, of Elland, have been entrusted by the Worthing Gas Company with a contract for the erection of twelve beds of eight retorts in regenerative settings, with chimney and retort fittings and ironwork complete. The same firm have also secured the contract for an iron roof for the new retort-house. The whole of the work is being carried out under the superintendence of the Company's Engineer (Mr. W. A. Walker).

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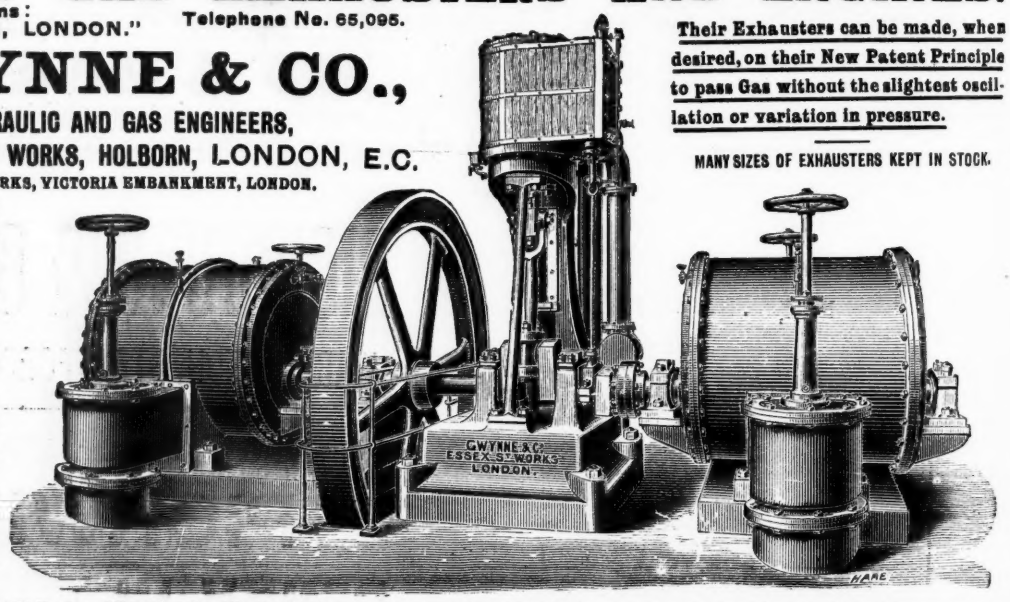

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[For Illustrated Advertisement, see p. 804.]

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And J. EVERY & SON, Phœnix Iron-Works, LEWES.

TO GAS AND WATER OFFICIALS.

SPECIAL and Favourable Terms for CYCLES are offered. The very best "up-to-date" Cycle at a reasonable Cost. "Dunlop" Tyres, Weldless Tube throughout, "Westwood" Rims, "Brook's" Saddle, "Perry's" or "Renold's" Chain, &c. The whole combining to make as fine a Machine as is possible to be made. Satisfaction guaranteed. Send at once for Catalogue post free.
MELROSE CYCLE COMPANY, COVENTRY.

THE Directors of the Galway Gaslight Company, Limited, will, at their Meeting to be held on Wednesday, the 21st day of April, 1897, appoint a suitable person as MANAGER of their Works.
Salary £100 per annum, with Residence on the Premises, Fuel, and Light.
Applications, accompanied by Testimonials as to character and efficiency, addressed to the presiding Chairman, will be received up to One o'clock on the day of Meeting.
By order,
J. B. HUDSON,
Secretary.
Gas Offices, Queen Street,
Galway, March 31, 1897.

GAS TAR and Ammoniacal Liquor Wanted.
Apply to JOSIAH HARDMAN, Milton, STAFFS.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating Price per ton and quantity, No. 2772, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Broadstairs Gas Company have FOR SALE a second-hand GASHOLDER, 24 feet diameter by 16 feet deep.
Price and Particulars may be had of the MANAGER.

FOR SALE—Anderson's combined WASHER and SCRUBBER, with Four-Way Valve and 10-inch Connections, suitable for about 150,000 cubic feet per day.
Apply to
THOS. PRICE,
Engineer and Manager.
Gas-Works, Walton-on-Thames.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also COMPLETE WORKS equal to 7000, 20,000, 60,000 cubic feet per diem. **Inquire and compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

FOR SALE—Young's Washer-Scrubber, with 8-inch Valves and Connections, in capital order. May be seen working.
STATION METER (W. & B. Cowan's make); 3½-inch Valves and Connections.
Also a Small PORTABLE VERTICAL BOILER, equal to new.
Apply for Particulars to WM. B. M'LUSKY, Gas-Works, KELSO, N.B.

WARRINGTON CORPORATION.
(GAS DEPARTMENT.)

REMOVAL OF WORKS.

FOR SALE—18-in. by 14-in. O, and 15-inch and 18-inch Round, MOUTHPIECES, HYDRAULIC MAINS, ASCENSION-PIPES, FURNACE FITTINGS, EXHAUSTERS, TAR-WASHER, 18-inch CENTRE and FOUR-WAY PURIFIER VALVES, 12-inch HYDRAULIC CENTRE-VALVE, METER (12-inch Connections), ENGINES, PUMPS, &c.
Apply for Particulars to Mr. W. S. Haddock, Engineer.
FREDK. TAYLOR, Secretary.
Gas-Works, Warrington.

FOR SALE—Six Clay D-Retorts 7 ft. 9 in. full length, inside measurement 13 in. by 13 in. No Mouthpieces. In good condition.

Retorts will be put on Rail at Malling Railway Station. The Purchaser to pay carriage from Malling.

Offers invited, which must reach me by the 13th of April.

HENRY D. WILDES,
Secretary.

Gas Company, West Malling,
April 2, 1897.

TENDERS are invited for Lighting the City of S. PAULO (BRAZIL) BY GAS, and must be sent under sealed covers, marked "Illuminação a Gaz da Cidade de S. Paulo," to the Secretaria da Agricultura, Commercio, e Obras Publicas (Department of Agriculture, Commerce, and Public Works), S. Paulo, Brazil, or to the Ministerio de Industria, Viação, e Obras Publicas (Ministry of Industry, Roads, and Public Works), Rio de Janeiro, in time to reach either of the said Departments not later than Three o'clock p.m., on the 30th of April, 1897.

Particulars may be had on application, by letter, to the Brazilian Legation, London; or to the Brazilian Consulates in London, Liverpool, or Glasgow, to the care of any one of which tenders may also be addressed, provided they are delivered soon enough to be forwarded for re-delivery to the said Departments by the date and hour above specified.

Plans of the City of S. Paulo may be inspected at the BRAZILIAN CONSULATE, 6, Great Winchester Street, LONDON, E.C.

COUNTY BOROUGH OF BURY.

TO SULPHURIC ACID MAKERS.

THE Gas Committee of the Bury Corporation are prepared to receive TENDERS for the supply of about 350 Tons of SULPHURIC ACID for the Manufacture of Sulphate of Ammonia, for a period of One Year from the 1st of May, 1897.

Form of Tender and Conditions may be obtained on application to Mr. W. H. S. Gendall, Engineer and Manager, Gas-Works, Bury.

Sealed tenders, endorsed "Tender for Acid," to be sent to me the undersigned on or before Monday, the 19th of April, 1897.

Preference will be given to those persons or firms who pay to their workpeople the regular standard rate of wages obtaining at the time in the town or district.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
April 1, 1897.

WALLASEY GAS-WORKS.

TO COAL MERCHANTS AND OTHERS.

THE Wallasey Urban District Council are prepared to receive TENDERS for the supply of about 23,500 Tons of CANNEL and GAS COAL for their Gas-Works, delivered in Waggons at Duke Street, Birkenhead, separately, for One, Two, or Three Years from the 30th of June next.

Specifications and any further Information may be obtained on application to the Engineer at the said Works.

Sealed tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be left at my Office, as below, not later than Four o'clock in the Afternoon of Thursday, the 22nd inst.

The Contractor will be required to enter into a bond, with approved sureties, for the due performance of the Contract, which Contract and Bond will be prepared at the expense of the Contractor.

The Council do not bind themselves to accept the lowest or any tender.

By order,
W. DANGER,
Clerk to the Council.

Public Offices: Egremont, Cheshire,
April 2, 1897.

WALLASEY URBAN DISTRICT COUNCIL.

CONTRACT FOR STORES.

GAS AND WATER AND ELECTRICAL WORKS.

THE Wallasey Urban District Council are prepared to receive TENDERS to supply, for a period of Twelve Months, from the 30th of June next, the following among other ARTICLES; being the principal Stores required for the use of their Gas and Water and Electrical Works, viz.:—

STOPCOCKS, MAIN-TAPS, FERRULES.	OILS.
FIRE-BRICKS and RETORTS.	LEAD and WROUGHT-IRON PIPES.
FIRE SPADES and COAL SHOVELS.	CAST-IRON MAIN PIPES.
IRON (BAR, SHEET, and PLATE).	COTTON WASTE.
LIME.	METERS, GAS, WATER, and ELECTRICITY.
PAPER INSULATED CONCENTRIC CABLES.	LAMP COLUMNS and LAMPS.
	MAIN SWITCHES and CUT-OUTS.

Further Particulars, with Forms of Tender, may be had, and Samples inspected, on application at the Gas and Water Engineer's Office, at the Works, Great Float, near Birkenhead.

Sealed tenders, which must be on the printed forms, properly endorsed, and addressed to the Chairman of the Gas and Water Committee, to be left at my Office, as below, not later than Four o'clock in the Afternoon of Thursday, the 22nd inst.

The Contractors will be required to enter into formal contracts, and may also be required to give security, in conformity with the Public Health Act, 1875.

The Council reserve the power to accept the whole or part of a tender, and do not bind themselves to accept the lowest or any tender.

By order,
W. DANGER,
Clerk to the Council.

Public Offices: Egremont, Cheshire,
April 2, 1897.

PUBLICATIONS
ISSUED BY
WALTER KING,
11, BOLT COURT, FLEET STREET, LONDON, E.C.

ALL PARCELS SENT CARRIAGE FREE.

Price 7s. 6d. per 100; £3 *per* 1000 (*Carriage Free*), *Demy 4to.*,

A LEAFLET ON
SULPHATE OF AMMONIA:
ITS SOURCE—RELATIONSHIP TO SOIL—EFFECT ON PLANTS.

By H. H. COUSINS, M.A.,
South-Eastern Agricultural College, Wye.

This is a Reprint from the "JOURNAL" of three Articles, which are of a character eminently suitable for distribution among Farmers and other users of Artificial Manures.

THE CHEMISTRY OF ILLUMINATING GAS.—By NORTON H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S. Price, bound in cloth, 6/-.

THE VALUATION OF GAS-WORKS FOR ASSESSMENT.—By THOMAS NEWBIGGING, M.Inst.C.E. Price 3/6 (76 pages, demy 8vo., limp cloth).

THE SCIENCE AND PRACTICE OF LIGHTING as applied to Streets, Open Spaces, and Interiors.—By W. H. Y. WEBBER. Price 3/6 (Demy 8vo. cloth).

GASHOLDERS WITH OR WITHOUT GUIDE-FRAMING.—A Discussion between E. Lloyd Pease and F. Southwell Cripps. To which is added a Synopsis of all the Literature (English and Foreign) on Reducing or Abolishing the Guide-Framing of Gasholders, also the principal Literature on Gasholder Construction generally, compiled to March, 1893; with a List of all the English and Foreign Periodicals connected with the Gas Industry.—By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E. In Paper Covers. Price 1/-.

THE COMPOSITION AND USE OF GAS LIME IN AGRICULTURE.—By (the late) Dr. A. VOELCKER, Professor of Chemistry to the Royal Agricultural Society of England. A 4-pp. leaflet for distribution among farmers and others. Price 5/- per 100.

ORDERS FOR OTHER TECHNICAL PUBLICATIONS WILL BE EXECUTED AT PUBLISHERS' PRICES.

SKIPTON GAS COMPANY.

THE Directors of this Company are prepared to receive TENDERS for the supply of 3000 or 6000 to 6500 Tons of best screened GAS COAL, to be delivered in such quantities and at such times as may be required during the Twelve Months ending June 30, 1898.

Quotations to specify price free on rails at Skipton, or delivered into the Company's Coal-Sheds alongside the Canal.

Sealed tenders, endorsed "Tender for Coal," to be sent to me not later than April 12 next.

The Directors will not be bound to accept the lowest or any tender.

J. HAIGH,
Secretary.

March 26, 1897.

DARWEN CORPORATION GAS-WORKS.

TO TAR DISTILLERS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for all the surplus GAS TAR produced at their Gas-Works for One Year ending the 31st of March, 1898.

All Information may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed tenders, endorsed "Tar," to be sent to me not later than Twelve noon, the 13th of April.

CHAS. COSTEKER,
Town Clerk.

March 30, 1897.

BOROUGH OF DARWEN.

TENDERS FOR COAL AND CANNEL.

THE Corporation are prepared to receive TENDERS for the supply of COAL and CANNEL for One, Two, or Three Years, to be delivered at the Gas-Works Siding in the Corporation Waggons.

Forms of Tender, and all Information as to quantities, may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed tenders, endorsed "Coal" and "Cannel," must be delivered to the undersigned a or before noon on Tuesday, the 13th day of April.

No tender necessarily accepted.

By order,
CHAS. COSTEKER,
Town Clerk.

Town Clerk's Offices, Darwen,
March 30, 1897.

BOROUGH OF ROCHDALE.

PETROLEUM SPIRIT.

THE Gas Committee of the above Corporation invite TENDERS for the supply of such quantities of PETROLEUM SPIRIT (specific gravity ·680), as they may require during the ensuing Twelve Months.

Forms of Tender and any further Information may be obtained on application to Mr. T. Banbury Ball Manager at the Gas-Works.

Tenders, endorsed "Carburine," must be sent in to me not later than noon on Wednesday, April 14, 1897.

By order,
JAMES LEACH,
Deputy Town Clerk.

Town Hall, Rochdale,
April 3, 1897.

BOROUGH OF MACCLESFIELD.

TENDERS FOR TAR & AMMONIACAL LIQUOR.

THE Gas Committee are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months commencing the 1st day of May next.

Tenders for the Tar or Liquor, separately, to be sent in not later than Saturday, the 10th of April, 1897, addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar," &c.

For Conditions apply to Mr. Newbigging, Engineer, Gas-Works, Macclesfield.

The Committee reserve to themselves the right of accepting any tender for the Tar or Liquor separately.

The highest or any tender not necessarily accepted.

W. FREDK. TAYLOR,
Town Clerk.

March 9, 1897.

LIVERPOOL UNITED GASLIGHT COMPANY.

TENDERS FOR CANNEL.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the supply of 60,000 Tons of CANNEL, to be delivered at the various Works of the Company during the period of Twelve Months between the 1st of July, 1897, and the 30th of June, 1898.

Tenders will be received for the whole or any portion of the above quantity.

The Directors reserve the right to accept tenders for the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.

Full Particulars and printed Forms of Tender can be obtained, on application to the undersigned, at the Gas Office, Duke Street, Liverpool, to whom Tenders (on the printed form only) must be delivered at or before Ten a.m., on Thursday, April 22, endorsed "Tender for Cannel." By order,

WILLIAM KING,
Engineer.

Gas Office, Duke Street, Liverpool,
March 25, 1897.

CORPORATION OF LEICESTER.

SEC. 2.	CONTRACT 35.	CAST-IRON FLOORING-PLATES AND COLUMNS.
,,	,,	37. ROLLED STEEL JOISTS, &c.
,,	,,	39. SHEDDING.
,,	,,	40. TRAVELLING CRANE.
,,	,,	41. PURIFIERS.
,,	,,	45. CONDENSERS.

THE Gas and Electric Lighting Committee are prepared to receive separate TENDERS for the supply and erection of any of the above required at their Aylestone Road Works.

Drawings may be seen, and Specifications and Forms of Tender obtained, upon application to the Engineer, and on payment in each case of the sum of £5, which amount will be returned upon receipt of a *bond-fide* tender.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for———," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, April 10, 1897.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, March 24, 1897.

COUNTY BOROUGH OF WIGAN.

THE Gas and Electric Lighting Committee invite TENDERS as follows:—

Contract No. 1—	CAST MAINS and CONNECTIONS.
,, 2—	WROUGHT-IRON TUBE and FITTINGS.
,, 3—	BRASS TUBE and FITTINGS.
,, 4—	LEAD PIPE.
,, 5—	FIRING & CHARGING SHOVELS.
,, 6—	BROOMS.
,, 7—	WOOD TROUGHING & COVERING
,, 8—	GALVANIZED STOVE PIPE and CONNECTIONS.
,, 9—	BAR IRON.
,, 10—	STREET-LAMPS.

The contracts will be for One Year, commencing on the 1st of April, 1897, and ending on the 31st of March, 1898.

Forms of Tender to be obtained from the undersigned.

The Committee do not bind themselves to accept the lowest or any tender.

Tenders, sealed and endorsed with the name of the article tendered for (a sample of which must be forwarded, addressed to the Gas Engineer), to be addressed and delivered to J. J. Charnock, Esq., Town Clerk, Town Hall, on or before Tuesday, the 20th of April next.

JOSEPH TIMMINS,
Engineer.

Borough Gas-Works, Wigan,
March 30, 1897.

TO TAR DISTILLERS AND OTHERS.

THE Corporation of Beverley are prepared to receive TENDERS for the purchase of the surplus TAR made at the Beverley Gas-Works for One Year from and after the 1st of May next.

Further Particulars may be obtained from Mr. Gibson, the Manager at the Works.

Endorsed tenders to be sent to me not later than Monday, the 26th inst.

By order,
J. WILLIS MILLS,
Town Clerk.

Guildhall, Beverley,
April 2, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.,
And at STROUD, GLOUCESTERSHIRE.

HOLMSIDE GAS COALS.
PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.
PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.
RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . $13\frac{1}{2}$ Cwt. Per Ton.
Sulphur . . . . . 1·18 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor $94\frac{1}{2}$ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS.
Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

HEBBURN MAIN GAS COALS.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.
For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

NOTICE.
"IMPROVED INCANDESCENT COMPANY."
L. S. LIEBERMANN & CO.,
Of 8, ALDGATE HIGH STREET,
WHOLESALE AND EXPORT
DEALERS IN INCANDESCENT GAS-FITTINGS

Have no Connection with the above Company. They have no Travellers in the Provinces, and do not sell Mantles.
Cheapest House for all Incandescent Fittings. Send for Price List.
THE BEST BURNER IN THE KINGDOM,
ONLY 6s. PER DOZEN.

EXTRACTION APPARATUS
SPECIALLY DESIGNED
TO EXTRACT THE SULPHUR FROM SPENT OXIDE.
BUILT BY
WEGELIN & HÜBNER, HALLE a/S.
ENGINEERS AND IRONFOUNDERS.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—
Yield of Gas per ton . . 10,500 Cubic Feet.
Illuminating Power . . 16·9 Candles.
Coke . . . . . 66·7 Coke.
Sulphur . . . . . 0·86 Sulphur.
Ash . . . . . 2·04 Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the
HARTON COAL COMPANY, LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL
AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,
for
CANNEL & COAL.

TYNE
BOGHEAD
CANNEL.
Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP
GAS COAL.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 17·8 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN
GAS COAL.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21 JOHN STREET, ADELPHI, LONDON, W.C.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 84, OLD BROAD ST., E.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

EVESON FOR CANNEL

TELEGRAMS:

"EVESON, BIRMINGHAM."

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

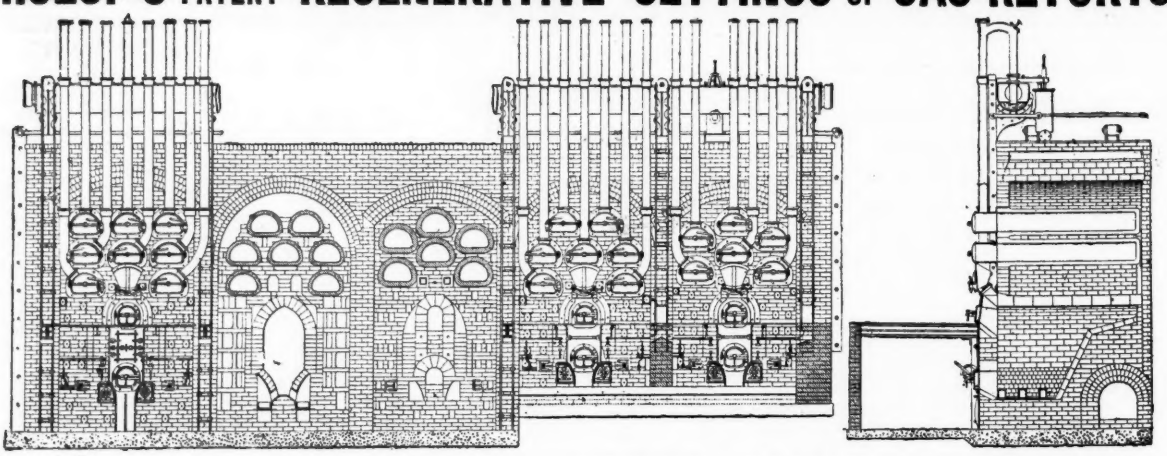
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non*

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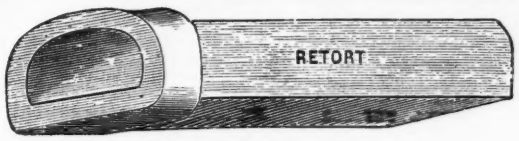

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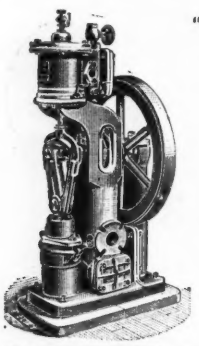

Fig. 703. "SINGLE RAM" STEAM-PUMP.

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

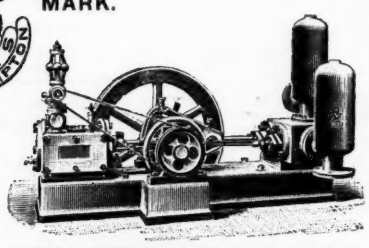

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

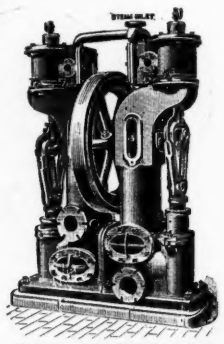

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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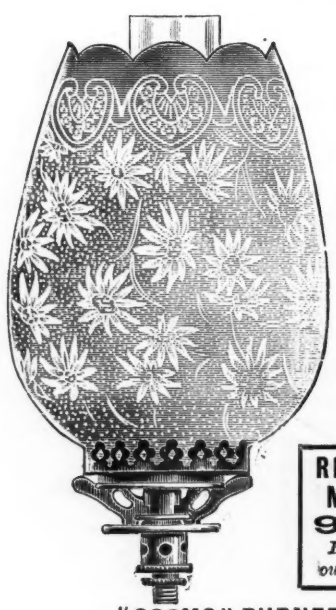

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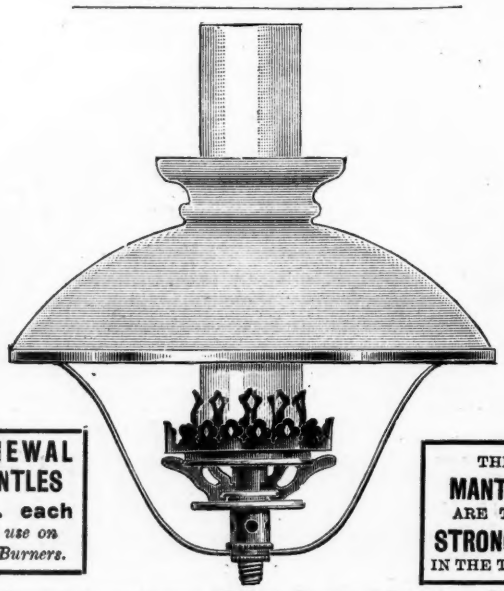

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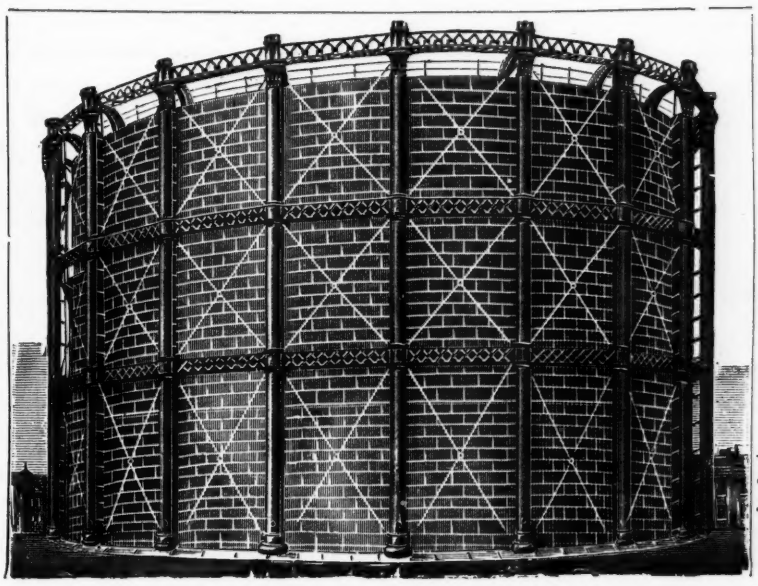

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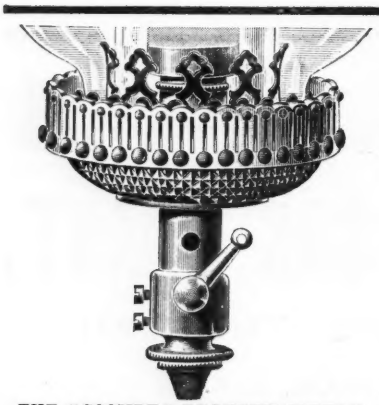

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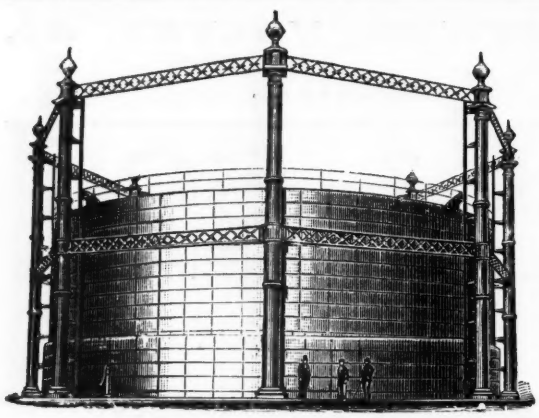

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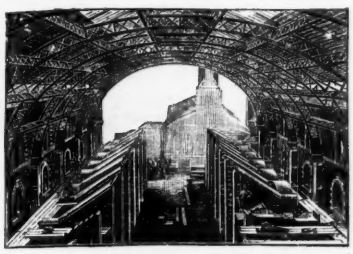

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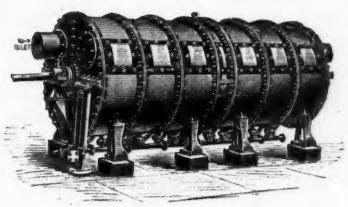

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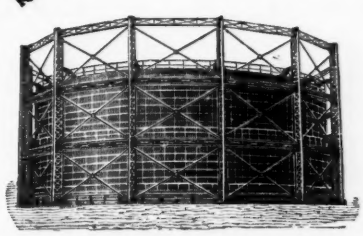

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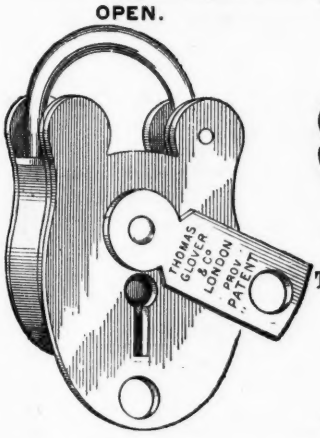

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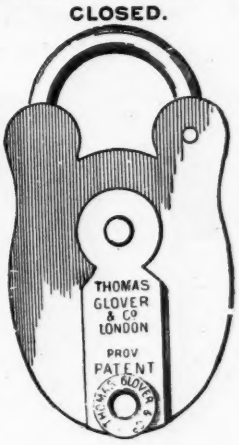

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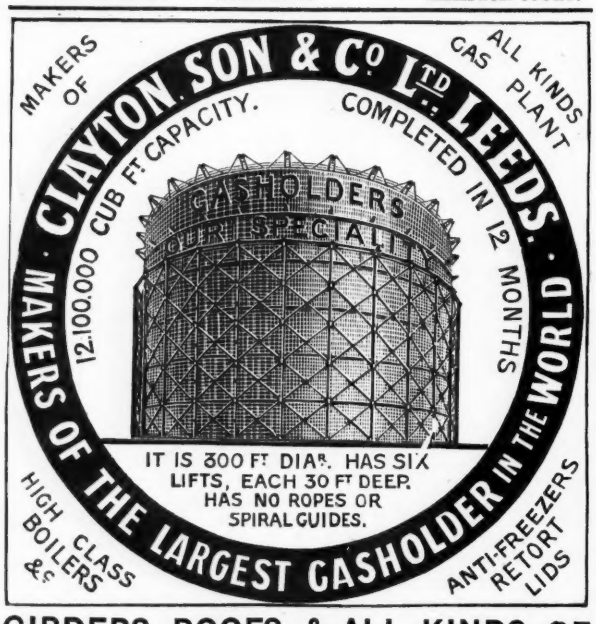
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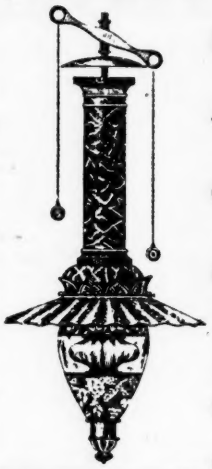

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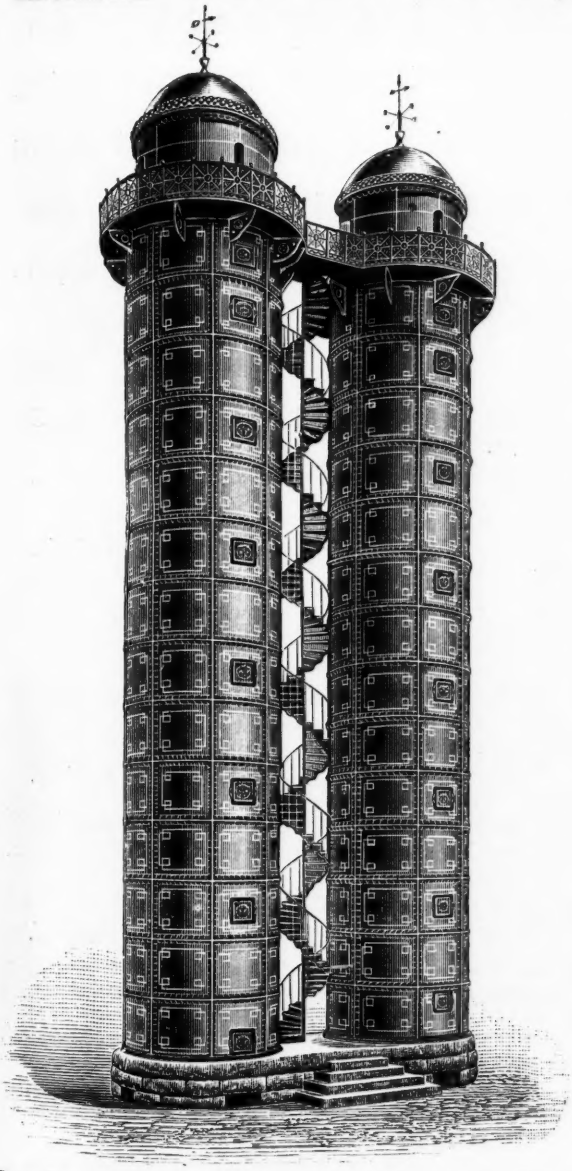

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[See also Advt. p. 764.

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